



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

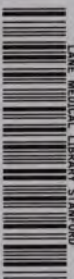
About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

Biographic Clinics

INFLUENCE OF VISUAL
FUNCTION UPON HEALTH

2 45 0270 3518



LANE MEDICAL LIBRARY STAMFORD

LANE



JOHN HENRY MEYER FUND

BIOGRAPHIC CLINICS

GOULD

BIOGRAPHIC CLINICS

VOLUME III

ESSAYS CONCERNING THE INFLUENCE OF
VISUAL FUNCTION PATHOLOGIC AND PHYSIOLOGIC
UPON THE HEALTH OF PATIENTS

BY

GEORGE M. GOULD, M.D.

Editor of *AMERICAN MEDICINE*, Author of "An Illustrated Dictionary of Medicine,
Biology, etc.," "Borderland Studies," "The Meaning
and the Method of Life," etc.

PHILADELPHIA :
P. BLAKISTON'S SON & CO.
1012 WALNUT STREET
1905

COPYRIGHT 1905
By GEORGE M. GOULD, M.D.

YOUNG MAN

PRESS OF
THE NEW ERA PRINTING COMPANY,
LANCASTER, PA.

11 ~ ~
G 696
1903-9

TABLE OF CONTENTS.

	PAGE
INTRODUCTION	I
CHAPTER I. THE NEW OPHTHALMOLOGY AND ITS RELATION TO GENERAL MEDICINE, BIOLOGY AND SOCIOLOGY	25
CHAPTER II. THE LIFE TRAGEDY OF JOHN ADDING- TON SYMONDS	75
CHAPTER III. TAINE'S ILL-HEALTH	97
CHAPTER IV. EYESTRAIN AS A CAUSE OF HEADACHE AND OTHER NEUROSES, BY SIMEON SNELL, F.R.C.S.Ed.	115
CHAPTER V. SLIGHT ERRORS OF REFRACTION AND THEIR INFLUENCE ON THE NERVOUS SYSTEM, BY C. ERNEST PRONGER, F.R.C.S.	155
CHAPTER VI. THE HISTORY AND ETIOLOGY OF "MI- GRAINE"	199
CHAPTER VII. THE OPTIC AND OCULAR FACTORS IN THE ETIOLOGY OF THE SCOLIOSIS OF SCHOOL CHILDREN	249
CHAPTER VIII. VISUAL FUNCTION THE CAUSE OF SLANTED HANDWRITING; ITS RELA- TION TO SCHOOL HYGIENE, SCHOOL DESKS, MALPOSTURE, SPINAL CUR- VATURE, AND MYOPIA	295

CHAPTER IX.	DEXTRALITY AND SINISTRALITY . . .	339
CHAPTER X.	THE PATHOLOGIC RESULTS OF DEXTROC- ULARITY AND SINISTROCULARITY . . .	361
CHAPTER XI.	SUBNORMAL ACCOMMODATION AND PREMATURE PRESBYOPIA . . .	375
CHAPTER XII.	THE RECEPTION OF MEDICAL DIS- COVERIES	413
CHAPTER XIII.	SOME PROBLEMS OF PRESBYOPIA . . .	469
APPENDIX A.	SUGGESTIONS AS TO POSTMYDRIATIC REFRACTION TESTS	483
APPENDIX B.	A CASE OF "MATHEMATICALLY PER- FECT EYES"	491

INTRODUCTION.

The examination of 7,166 school children in New York City in 1905 showed that 1,273, or more than 17 percent, were suffering from defective eyesight of the worst or most evident kinds. A much larger proportion have smaller defects, and these added to the more manifest ones make a total of over 33 percent which had defects interfering with the pursuit of their studies. But these examinations took note only of the manifest errors of refraction or disease, and the kinds of eyestrain which have the worst reflex effects upon the general health are those caused by the low errors not manifest and which may be temporarily overcome by morbid effort. It is therefore abundantly demonstrated that almost everything urged by refractionists as to the pernicious influence of eyestrain is more than true. This is also suggested by further items of the report which state that of the 7,166 there were also the following cases:

Bad nutrition	632
Nervous diseases	85
Cardiac diseases	133
Pulmonary diseases	127
Skin diseases	126
Deformity of spine.....	63

INTRODUCTION.

Deformity of chest.....	100
Bad mentality	650
Total cases requiring medical attention	<u>3,132</u>

I have long and often urged the influence of eyestrain as a cause of truancy, and hence of crime. It is gratifying to find Dr. Cronin, the Chief of the Division of School Inspection of the New York Department of Health, thus summarize his conclusions:

"Physical defects of one sort or another are the cause of bad habits, truancy, and moral obliquity in later life. It is the physically defective who leave school early or become hopeless truants. Truancy is the first stage of a criminal career, and by improving the physical condition of children we save many of them from the downward path. If some of the unhallowed money which is now causing so much useless talk with reference to its acceptance for the purpose of civilizing savages were directed toward the poor people from whom it came, that money would be sufficiently purified to satisfy all consciences. The poor children of the tenements should be able to have glasses when they need them. The city, too, should appropriate funds to pursue the work so well begun and so as to improve as much as possible the physical status of the school child of the present."

All preexisting evils of eyestrain and ill-health are tremendously exaggerated by the morbid writing posture taught or allowed in our schools. That 27 per cent of European, and undoubtedly of American, school children, have lateral curvature of the spine by the time they are 14 years old is, literally, an awful charge against our blundering, both pedagogic and

professional. If, as I am firmly convinced, this terrible disease of one-fourth of the coming generation is, with all its secondary morbidity, due to a neglect of the demands and diseases of the visual function, the crime of the neglecters, indifferentists and contemners is one that demands a summary ending. Several orthopedists have written me letters upon the subject. I have pleasure in quoting one such :

"I have read your article 'The Optic and Ocular Factors in the Etiology of the Scoliosis of School Children' with profound interest and benefit. As I have examined so many patients in whom you have found peculiar etiological factors of astigmatism and have satisfactorily confirmed the relations that you have discovered I find great profit from studying your elaborate article. I cannot refrain from expressing to you my appreciation of your courtesy in permitting me to be associated with you in this unique discovery in so far as to examine the spines of your patients. I am convinced that your discovery will remove the 'idiopathic' from use in connection with Scoliosis. Because we did not know we said idiopathic, but now we will know and try to prevent the deformity of Scoliosis.

"I heartily congratulate you upon adding to our knowledge a definite scientific truth. Knowing the adverse criticism that is always heaped upon original investigators I take pleasure in asking you to accept my favorable comments in the spirit in which they are offered. Very cordially yours,

H. AUGUSTUS WILSON."

One of the greatest of American public school teachers thus writes :

"Dr. ——— brought me the copy of the *Medical Record* in which your article on the evil consequences of the condition

under which we compel children to write is published. We are both tremendously interested in it, and we could cite more proofs of the truth of your argument if it needed them. Now I know why I have wanted young children to be allowed to use the blackboard and the sand-table more when learning to write. Some of these days I shall become frank and write an energetic and (for a teacher) ill-advised philippic which I shall entitle 'The Curse of Literacy.' How does the idea strike you? You should have seen the fine children I met in my journey among the Pueblo Indians of New Mexico and Arizona. Keen eyes, straight bodies, magnificent lungs, steady nerves—and not an alphabet among them all! However, let the good work go on, and one of these days people may come to understand that it profits a man mighty little (and a woman still less) to gain the world of book-learning and lose health."

A majority of the citizens of the United States are so educated or conditioned that they cannot procure a little optical device necessary for their health, their happiness, and their intellectual progress. Either they are so ignorant that they do not know the nature of their need and the obstacles which prevent relief, or, if knowing, they are so circumstanced that proper spectacles cannot be obtained. Of this majority one-half, by the ignorance and unskillfulness of opticians, are not able to secure such an adjustment of scientifically-made lenses to the eyes as to give the requisite relief of eyestrain. Only a few city opticians are sufficiently expert to adjust glasses, when rightly prescribed and ground, the majority of the vendors, even in cities, being incapables. These incapables, of

course, are moving heaven and earth, and especially legislatures, to give them powers to do the physicians' work of prescribing the glasses which they as artisans cannot even place properly before the patient's eyes. But the majority of patients needing scientific advice cannot consult the city oculists. They live in the country and are too poor or too far removed, or too ignorant, to find the capable city oculist. They are therefore the prey of the traveling spectacle-vendor, who should often be jailed, the quack optician and oculist, the "jeweler" who knows nothing of optics or of ophthalmology. All of this constitutes a severe indictment of the medical profession and of the public for dereliction of duty. The generation-long neglect of the profound influence of small errors of refraction upon the general health, a neglect which is still fostered by the so-called leaders of the profession, gives warrant to school-boards, trustees and teachers, and hygienists generally, to continue the sources of a large part of the ills which occupy physicians and delay social progress. It seems not altogether impossible that the already alarming disrespect towards us of the lay-world will be increased by the failure of the medical men and their organizations to take up the work of which a more enlightened public sentiment is fast realizing the immense importance. That ophthalmologists themselves should so often be the leaders in this cynical and blameworthy indifference is one of the

mysteries and disgraces of our time. Probably a hundred articles are being published every week in the medical journals of the world treating of diseases that are or may be the result of eyestrain, and yet there is not a line in them which alludes to this cause. Text-books of course are still further behind the serial literature. Great ophthalmologic societies meet monthly or annually with scarcely an allusion or a title showing interest in the subject. Some recent happenings would seem to indicate that the ideal of medical men must be one whose interest in the patient is limited to naming his disease; who believes little in, and cares less for, curing; whose pathology is solely anatomic. To heal and to learn the causes and prevention of disease would seem worthier and more professional aims, even if not fashionable ones.

Concerning the two previous volumes of *Biographic Clinics*, there have appeared in medical literature few or no destructive criticisms of the positions taken which are worth answering. The voice of ignorance and prejudice was expected and could not surprise. The oculists who could not refract correctly and who therefore had never seen in their patients such results as I have described, were and remain openly opposing or secretly scorning. Another class, half convinced, have preferred to keep a discreet silence for fear of allying themselves with the "extremists and exaggerators," and of losing referred cases sent by

the general practitioner, the surgeon, or the neurologist. The tenotomists have of course risen as a man to claim all, and to reemphasize their old exploded theory, and have thus frightened a few timid ones away from assent to any similar "hobby-riding." Over the heads of these, "gentlemen all," has softly waved the banner of that delightful egotism which pities us, the narrow-minded ones, because we have not the broad general medical knowledge and philosophic aplomb to guard against the self-interest, the puerile enthusiasms, and the limitations of specialism.

Anatomic pathology, having ended in the blind alley of *non possumus*, has yet to turn and ask as to the nature and methods of production of the morbid function which caused the special organic disease which caused the patient's death. The pathologic slide is the scientific House that Jack Built. When one asks about the rat that ate the malt, the cat that killed the rat, the dog that worried the cat, and all the rest, the impertinent is frequently met by an amazed stare ending in a stupid sneer. But after all our pathology the intolerable question recurs as to any explanation of structure except by precedent function. After all our slide-making, indeed, as a result of it, has it not been more and more manifest that prevention of disease is the true work of the conscientious physician, and that "the soil" is as responsible for the end-products of disease as is "the seed"? The contention that in

biology the function and malfunction of vision has been a large conditioning factor of organic evolution, the truth that in all our sociology and pathology the same factor is increasingly a controlling and crippling source of evil and failure,—this must be acknowledged, and in its past attitude the profession is stultifying itself and preventing its possible magnificent progress.

An unwise councilor has recently advised young men against the investigations of medical problems which are not popular and fashionable. He should have lent his authority to the truth, which is the opposite of this cheap notoriety-seeking. The true thinker and discoverer chooses to “waste his life,” as the after-dinner orator termed it, in experimentation and thought upon that which, even in medicine, is not the fad of the day. Of course if the young medical man is seeking after leadership, honorary degrees, professorships, he must as a popularity-hunter and a success-seeker follow the cunning advice to watch and pursue the *Zeitgeist* with deft assiduity. But he will find that truth shuns the trickster.

But the tide is turning. A well-trained oculist, Dr. F. C. Hotz, of Chicago, in the April, 1905, number of the *Annals of Ophthalmology* writes thus:

“Although there are seventy-eight reasons why glasses may not give relief, the truth of the doctrine that refraction errors play a very prominent rôle in the etiology of headaches and

neuroses, is universally recognized and accepted by the oculists of this country, and has also begun to percolate into the ranks of the general practitioners. Neither the fact that the correction of abnormal refraction does not give relief in every case, nor the fact that many ametropes go through life without experiencing any discomfort from their uncorrected ametropia, is regarded as a valid argument against the overwhelming clinical evidence recorded in favor of this doctrine."

As to the method whereby eyestrain induces its effects, Dr. Robert T. Edes (*Boston Medical and Surgical Journal*, March 3, 1904) says:

"Certainly no local draft of energy could be more ingeniously adapted to bring out the earlier symptoms of neurasthenia and to develop them to the full in cases of lesser resistance than a pair of eyes incapable of perfect function separately or together, and yet not so thoroughly unfit as to completely prohibit their use for near vision. The constant and constantly unsuccessful attempt, from which there is no natural relief but disuse, and with necessity or ambition constantly pushing the imperfect organ to its never satisfactorily accomplished function, and then, too, this organ, the one upon which so much of useful activity in the higher walks of life depends, together with the psychic strain under feelings of failure and disappointment, make the ideal combination to develop nervous exhaustion under the highest tension possible."

The Continent of Europe still lingers in pitiful barbarism upon this subject. When my patients return from these benighted countries they tell tales that should be gathered for the amusement of coming and humor-loving generations. "American humbug"! —is the answer of protest that eyestrain may cause

any extraocular disease, or that it needs accurate or scientific diagnosis and treatment. In England the light is breaking. The courtesy of Mr. Pronger and of Mr. Snell allows me to reproduce two capital illustrations. I have found it impossible to gather or even epitomize a wealth of American articles.

To those numerous objectors who have asked for clinical proofs in my own practice of what they call the unproved theories of *Biographic Clinics*, I might say that a thousand could readily be given, but they would scarcely convince those who do not wish to be convinced. If I should follow out the suggestion it would give an added opportunity for slur and innuendo; however kindly disposed, I hesitate. Many indeed, as well as myself, have published reports of such cases, but these were as neglected as those of Dr. William Thomson twenty-five years ago. My first attempt at such reporting was made in 1888; I was the first, I think, to direct attention to the fact that errors of refraction exercise a great role in the psychologic development of the young. In part I wrote as follows:

“It is now a matter of common knowledge that the pathological relations of the eye and the rest of the system are of the most intimate nature; that refractive errors or muscular insufficiencies are the great prolific sources of headache, and that gastric troubles, and numerous forms of reflex neurosis, even chorea and more profound derangements of the nervous system, may be due to eyestrain. But no one seems to have

thought what a tremendous influence upon the character and life may be exerted by an uncorrected eyestrain. The microscopic size of the defect has served to keep it ignored, and its influence also minimized by the general ignorance of the extent and exceeding intimacy of relation of the organ of sight and the organ of mind. Indeed so thorough-going and widespread and causal are these relations that the effect of the other senses combined is but a fraction of that of vision in the creation of intellect. In the light of evolution and psychology, reason and mind may almost be said to be products of the visual mechanism. Language itself, the *sine qua non* of intellect and civilization, is but the record of things seen; the letters of the alphabet are each and all but conventionalized pictographs, and mental pictures, or signs of pictures, are the counters used by the mind in all the processes of logic or thought. The ocular mechanism is like a bank at which mental counters are tested and cashed with the coin of reality and truth. What more natural, therefore, than that a disorganized and faulty bank should disarrange the processes dependent upon it. If a false image, or one that is distorted, or one that is only reached by an exhausting expenditure of energy is the means of comparison, the action of the mind is disturbed, heredity is at war with reality, and the mental mechanism undergoes a subtile but profound change. It is, of course, in the young that this unfortunate process goes on at the most rapid rate, but is not noticed by parent or teacher. The most frequent methods in which an uncorrected eyestrain acts disastrously upon the developing mind is in making study and literary labor so irksome that the mind is slowly but irrevocably turned from intellectual pursuits and directed to physical activities for an outlet of its energy. This, in the formative period of the child and youth, is of the most absolute and tragical importance.

"A year ago a boy of nine was brought to me for examination of the eyes. He was a child of large brain, active mind, and fine character, whose parents were educated, intelligent

people. But *this boy had never learned his letters*. It had been utterly impossible for him to exercise his accommodation long enough upon a printed page to learn the alphabet. I corrected his hyperopic astigmatism, and within the past year he has more than made up for lost time; in reading, arithmetic, writing, and such studies being well ahead of the children of his age. The gist of the matter consists in the question, what would have been the result if this boy's parents had not been keen-witted enough to suspect ocular trouble? Plainly, the boy would have grown up with the poorest interests in intellectual pursuits, and more and more unconsciously driven to physical ones; a professional life would not have been chosen, and the position for which, by all the laws of heredity and endowment, he was fitted to take in life would, if thought of at all, have been only as a matter of regretful wonder on the part of parent or friend that it had not been adopted. I have had many similar examples in my practice. For instance, a woman 22 years old, came to me suspecting that her daily headaches, persisting for many years, might be connected with eye troubles. It was, indeed, so. Her headaches disappeared, and other nervous derangements and choreic affections, and her general deterioration of health was changed as if by magic from the day her hyperopic astigmatism and insufficiency were relieved. But I also was interested to learn that in the past ten years one by one the intellectual and esthetic occupations she had heroically undertaken had been laid aside, and everything dependent upon near vision, such as study, languages, painting, needle-work, music, etc., had been found so tiresome that her life had been wrenched from its natural order, and her whole mind had been regretfully turned to other exercises and uses.

"Still another somewhat pathetic case came to me last week. Parents and teachers had for years stupidly scolded and punished a bright little girl ten years old, because of her inattention to studies and because of her petulance, nervousness, and insubordination. In fact, the child was quite choreic,

and the pinched eyes and bent head told of eyestrain at once. Both eyes were astigmatic to the fearful degree of 5.50 D.—one of the highest astigmatic errors I ever have met with. Who can doubt that her spectacles will have the most happy effect in changing the child's disposition, character, and the trend of her whole life, not only physically but in a psychological sense? There can be no doubt that this subtle and far-reaching cause—eyestrain—is at work everywhere to balk and blight. How many vocations and careers—intellectual, professional, or esthetic—have been left unfilled, the natural aptitudes of character and endowment failing to reach their predestined fruition, because this subtle but effective enemy rendered it impossible? It is easy to poohpooh, and to talk glibly about the ridiculous conceits and exaggerations of the medical specialist. The question remains, Is it so or not so? If my contention is true to the extent of the one-hundredth part of what I believe, it is a matter of the most profound significance for every parent, guardian, or general physician. Exactly their particular child or patient or friend may be undergoing an experience that is molding the whole course of its future life, character, and influence upon the world. We cannot doubt that many a promising life has been switched, permanently crippled, into the side-tracks or lumber-yards of mercantile or humdrum life, that might have swept across continents, bearing its messages of intellectual honor and humanitarian service."

In 1889 I reported (*Medical and Surgical Reporter*, February 9, March 9) a case of chorea of several years' standing, one of flatulent dyspepsia of twenty years' continuance, one of cardiac palpitation, and a number of similar cases, cured at once and permanently by glasses. In the *American Journal of the Medical Sciences* for January, 1890, I gave the details

of a case of stammering due to hyperopia. One of a peculiar paralysis and anesthesia from eyestrain, one of chorea, one of aphonia, a number of dyspepsia and other gastric disorders. I have reported seven cases of nocturnal enuresis and as many of epilepsy cured immediately by spectacles. An important fallacy of the Rest-Cure Treatment, due to neglect of eyestrain, was published in the *Journal of the American Medical Association*, September 9, 1899. I have analyzed 1,500 consecutive cases of refraction-error showing that 19.3 percent of these had noteworthy morbid digestional effects, 58 percent headaches, and 81 percent some morbid reflex result. In 1892 (*Medical News*) I showed how the common occurrence of a dis-used and neglected eye, suffering from lack of glasses, produced disastrous results, and how it could often be brought back to life and usefulness. Some of the other papers bearing on the subject I reproduce in this volume. I regret that some writer does not collect and republish the many demonstrations contained in the articles of a multitude of American authors. Since the appearance of the first two volumes of *Biographic Clinics* one critic of marked ability has hastened to publish cautionary articles as to "pseudo-eyestrain" and "simulations of eyestrain," and more than one has kept up a persisting emphasis on the supposed fact that many sufferers from migraine and other eyestrain reflexes have no errors of refraction. The fallacy of

this logic is evident to those who know ophthalmic literature. There are at least seventy-eight reasons why such a statement may be untrue, as we all now recognize. The so-called "slight error of refraction" is precisely that which produces the worst and most far-away morbid results, as is shown in an article I published in the *British Medical Journal* in 1894. Two critics of this truth had said that a hopeless and incurable patient was possessed of "mathematically and optically perfect eyes." Gout, gout, and again gout, was their pronounciamento. But gout was incurable. The patient for eight years has had no "gout of the eyes," and may be consulted as to his opinion of the glasses worn during these years for "mathematically perfect eyes." The report of his case is included in the forelying volume as a corollary to seventy-eight reasons why glasses and no glasses failed to cure. An editorial in the *Journal* of the Michigan State Medical Society of July, 1905, states a truth of such importance that I feel compelled to quote the following passage:

The practice of refraction is one of the most laborious, complicated, and difficult fields of medical practice; and that competence in ophthalmology demands as a foundation the broadest knowledge of medicine and surgery, and a superstructure, of long training in delicacy of perception of slight variations from physiological function, in minute structures; a quickening of sound judgment, and a fineness of manipulation, only attained by actual experience with clinical material

under the guidance of a competent instructor. He who cannot unravel the relation of damaged, or deformed eye structure to the general nervous system, or who cannot read in the eye evidence of disease in distant organs, is quite unworthy the name of ophthalmologist. It cannot be too strongly urged that as druggists are for the compounding and sale of physicians' prescriptions, so opticians are for the adjustment of spectacle frames, and fitting therein the lenses which ophthalmologists have prescribed.

In another part of this volume I have said that those who should have been the wise judges and acceptors of new truth, have as a rule been its rejectors and enemies. In a recent number of *Science* I find a curious instance that the law is still operative, and not only in medicine and science, but in pedagogics,—of all fields that in which one would least expect to find it:

Mr. Frank A. Vanderlip, ex-assistant secretary of the Treasury, and now vice-president of the National City Bank, addressed the students of Girard College on May 20, on the general subject of educational benefactions. He is reported to have said:

"The professional educator is quite as likely to become narrow and provincial as is any other specialist. The president of one of our great eastern universities told me a few days ago that he had been making an exhaustive examination of the history of his institution, and he had discovered that the great progressive steps which the university had taken in 150 years had been against the protest and the opposition of the faculty. The trustees from time to time brought forward new plans of organization, and broader ideas regarding the curriculum. The faculty had in every case voted adversely, and

when the changes were made, they were made only by the trustees taking the responsibility upon themselves. Alexander Hamilton, with his consummate wisdom, once worked out a plan of reorganization for the university, only to have it meet with the usual vote of emphatic protest from the faculty, but final adoption by the trustees. Now, in the light of years of experience, these changes have been seen to be wise in the main. The unavailing protests of the learned men who made up the institution's faculty are discovered sometimes to have been based on narrow grounds lacking the impersonal view and judgment that should have been brought to bear upon the question."

Far from acknowledging their error these gentlemen are probably now claiming that they have been and are the helpers in the new education—of the past and now established—but it is also quite sure that they are as unitedly and blindly opposing the new education of the future yet to be established. It is still true that in proportion to the progress evidenced in the acceptance of the truth of reflex ocular neuroses the reactionary spirit becomes more reckless and fatuous. In Germany the whole subject is dismissed as "American humbug." In England it elicits that characteristic reply of attempted irony which exhibits self-satisfied prejudice rather than zeal for investigation. Under compulsion writers may be forced to allude to the subject, but only as an evidence of unjustified hobby-riding, "possessed by a theory," etc., and deftly passed over as unworthy of a true scientist. Thus Berry says, "While in some

way or other astigmatism may give rise to headaches, it is equally certain that its influence in this respect has been greatly exaggerated." Far from a wise and humane desire to learn if it may not also give rise to other troubles than headache, there is evidently in such authors not the least curiosity to learn how astigmatism "may cause" headaches, how many it may cause, nor how they may be relieved. Despite the amazing amount of testimony to the role of eyestrain in general pathogenesis in our country a multitude of text-books are being issued by our medical writers and publishers which ignore the matter entirely, or worse, flippantly. In 1905 ophthalmologists (Howe, Casey Wood) get up "collective investigations" which neither collect nor investigate, but which are designed to throw all possible obloquy upon the theory. The counting of noses is a poor way to establish truth and would not change the facts if the ballots were to be obtained nor if they were all yes or all no. Luckily the balloting proved a sorry blunder and a disastrous failure.

Besides the demonstrations of progress in the acceptance of the theory I have already set down, others are rapidly appearing. As examples may be cited the opinion of Dr. Ellis in his monumental *Life of Wagner*. In his fourth volume the theory I have offered as to the cause of Wagner's ill-health is repeatedly and continuously accepted and emphasized. Dr. Ellis is an accomplished physician and musician.

It seems that he is also a good logician. From private sources of information we have discovered perfect proofs that Wagner had astigmatism and that his personal sufferings and tragedy could largely if not entirely have been relieved if "American ophthalmic humbug" or that of any other national type could have been allowed to give him proper glasses. Dr. Ellis, in a private letter, points out a source of injury that I had overlooked: Each of several of Wagner's operas have over a million notes, the stems being of course at axis 90° , and the five ruled lines of the music paper at axis 180° . These notes were placed there by his hand governed by his astigmatic eyes!

One endeavor to solve the mysteries of the nervous and nutritional disorders generally classed as the paroxysmal neuroses (migraine, angina pectoris, asthma, bilious attacks, gout, epilepsy, dyspepsia, etc.) is a two-volume treatise about to be issued (by Longmans & Co.) by Dr. Francis Hare. Dr. Hare has sent me a copy issued for private circulation; the more complete work will have the title, *The Food Factor in Disease*. The work was nearly complete when the eyestrain theory of the source of these diseases was called to the author's attention. That theory, I think, largely transforms if not revolutionizes Dr. Hare's philosophy. There is hardly a page which it not flooded with new light by the fact that ametropia often or generally is the source of the evils and conditions he describes. With noble frankness Dr. Hare says:

"The adoption of the humoral (hyperpyræmic) hypothesis does not by any means involve the abandonment of the hypothesis of Gould. Many of the illustrious patients of whom he writes may well have suffered from ametropia; and the eyestrain so induced may quite possibly have been responsible for a state of increased vaso-motor irritability, and so for conditions of pathological prepotency. In this event, much of the relief from symptoms, which in their case followed physical exercise in the open air, would have been due to the incidental relief from eyestrain, and the abolition of eyestrain by properly correcting spectacles might have done much, if not all, to relieve their almost lifelong miseries. Many observations directly support the view that eyestrain is capable of causing increased vaso-motor irritability, and so of leading to exaggerated or disordered vaso-motor action.

"In the following case, the exaggerated vaso-dilation of the internal genitalia, responsible for dysmenorrhea, was clearly shown to be due to eyestrain. Mr. Alban Doran, in dwelling upon the necessity for following up the after-history of operation cases in order to verify reported recoveries, refers to a case of severe dysmenorrhea in which it was proposed to remove the ovaries. The symptoms, however, were relieved by the patient wearing spectacles suitable for the correction of her hypermetropia.

"It must, I think, be admitted that, in many cases, typical recurrent migraine has been abolished by the correction of ametropia by appropriate glasses, the necessary inference being that eye-strain was an essential factor of the migraine.

"Consequently, there is reason to anticipate that recurrent anorexia, dyspepsia, and biliousness will be found in some cases to own an essential factor in eyestrain from uncorrected ametropia. This anticipation is strongly supported by an increasing accumulation of clinical evidence at my disposal, most of which I have collected since the publication of Gould's 'Biographic Clinics.' This subject is of immense importance and deserves the fullest consideration.

"The subjoined history, given in Dr. Turner's own words, fully demonstrated, to me at least, the indispensability of both the humoral or supply factor and the neuro-vascular or functional factor (in this case grossly exaggerated by unconscious eyestrain) in the causation of what may be termed recurrent hepatic anorexia. Therein is fully emphasized, not only the influence on the attacks of those conditions, namely, external temperature, exercise, and diet, which, as already argued, influence the pyræmic state, but also the influence on the attacks, of eyestrain, which, I am now arguing, influence the responsiveness of the vaso-motor system to the pyræmic state.

"Such exalted irritability of the vaso-motor system depended very largely, if not mainly, upon unconscious eyestrain, chiefly from prolonged lens work.

"That the deficiency of fat-formation in this case depended, in great part at least, upon deficiency of supply, that is, of carbonaceous material in the blood-stream available for fat-construction capacity—is shown, I think, somewhat clearly by one of the carefully observed experiences of the patient. In order to add to his store of fat, it was only necessary to eliminate the peripheral irritation, eyestrain, upon which apparently depended most of the exaggerated responsiveness of the vaso-motor system to pyræmic conditions. This he achieved by keeping his eyes closed for many hours of the day and avoiding all near work at other times. The results of this manœuvre may be tabulated as follows:

"1. Cessation of the exaggerated responsiveness of the vaso-motor system to pyræmic conditions.

"2. Cessation of exaggerated hepatic glycogenesis.

"3. Increased delivery of sugar by the liver to the general blood-stream.

"4. Cessation of recurrent glycolytic distension.

"5. Increased digestion in, and absorption from, the alimentary canal, through removal of the constantly recurring hepatic block.

"6. Increased supply of nutritive material of all kinds to the general circulation.

"7. General increase of nutrition.

"We have now seen that urticaria, certain catarrhs, dysmenorrhea, recurrent hepatic anorexia, and migraine, all affections in which a pathological degree of vaso-dilation in different localities is an essential factor, may depend upon eye-strain from uncorrected ametropia; and there seems a possibility that some cases of epilepsy may arise from this cause. It would not be surprising, therefore, if there should be found cases of asthma and angina pectoris owing a similar causation."

Interesting recent testimony to the truth contended for is given in the report of a meeting of the Boston Society for Medical Improvement held December 5, 1904. The papers are published in the Boston *Medical and Surgical Journal*, February 23, 1905. Dr. Myles Standish demonstrates effectually that the "exaggerations" of those opposed to the theory of reflex ocular neuroses are fully equal to those who support the theory. He assents so far as one could wish to the truth that dyspepsia, general weakness, migraine, epilepsy in the young, etc., are often due to ametropia and curable by glasses. Dr. Allen Greenwood emphasizes the truth that mental feebleness and backwardness in children are often due to the same cause. Dr. Edwin E. Jack's experience teaches him that nausea, dizziness, dyspepsia, "the blues," nervousness and irritability, insomnia, brainfag, neurasthenia, and a general inability to take up the burdens of life may all be due to this cause. "To one who has seen many times the mental wreck which eyes can cause, such a

correction is far from incredible, and indeed does not seem unusual."

In the *Boston Medical and Surgical Journal* of June 22, 1905, Dr. G. L. Walton admits most that the majority of "extremists" desire as to the influence of eyestrain on the general nervous system. Coming from a neurologist the article is peculiarly noteworthy. I had often urged that the testimony of the blind would be of value as to the ocular origin of many nervous and systemic disease and Dr. Walton proves it. There is far more to be learned in that way than Dr. Walton brings out. Speaking generally, his valuable confession is, however, a forced one, and far from ingenuous. It is indeed a most curious fact of human nature which we see in so many who are now hastening to accept the theory of eyestrain ignored for thirty years. Their great zeal is for the limitations of the truth. They care far less for what is positive and helpful than for the negatives and failings of the theory. They have greater solicitude in pointing out the "constitutionality" of headache than in recognizing its ocular origin. It would seem that in confessing that these diseases may be cured by glasses, they are really afraid that one too many patients may be cured. Instead of delight in a new found therapeutic agency of admittedly vast power, there is a downright morbid fear it may really prove too great. And far from any gratitude for those

who have extorted the confession there is poorly concealed contempt which proceeds to amusing lengths. The worst of it all is that the question is treated as if it were a scientific or professional one, without influence upon the world's health and progress. The patient is forgotten in the endeavor to square one's prejudices and past errors with the coming truth. But professionally we exist only for the patients' good.

It may also seem trivial and unnecessary to call to the mind an axiomatic statement that as spectacles will not bring the dead to life, nor even arrest impending death from organic disease, neither will they, at least immediately, cure in all chronic cases of neurasthenia, hysteria, abused and broken-down nervous and digestional systems, ruined by twenty, thirty, or forty years of suffering. The eyestrain which frequently begot the later conditions could have been extinguished in the young and the neurologist should at least take to heart his own failure in such cases.

My thanks are due the editors and publishers of the *Popular Science Monthly*, of the *Journal of the American Medical Association*, the *Medical Record*, the *Maryland Medical Journal*, the *Annals of Ophthalmology*, *American Medicine*, etc., for courteous permission to republish articles appearing in their columns.

GEORGE M. GOULD.

PHILADELPHIA,
June, 1905.

THE NEW OPHTHALMOLOGY
AND ITS RELATION TO
GENERAL MEDICINE,
BIOLOGY AND
SOCIOLOGY.

CHAPTER I.

THE NEW OPHTHALMOLOGY AND ITS RELATION TO GENERAL MEDICINE, BIOLOGY, AND SOCIOLOGY.¹

THE distinction between what may be called the old ophthalmology and the new is one of almost unique clearness, as compared with other departments of medicine or science. Especially in medical practice the modern status has usually grown out of the older and oldest by infinitesimal increments and gradual modifications. In ophthalmology it is not so, and this fact explains why there are such profound differences of opinion as regards the claims of the new. Although both are usually practiced by the same men, they may be, and often are, as distinct in origin, theory and practice as, *e. g.*, are otology and ophthalmology.

The "old ophthalmology" was, and is concerned with inflammatory and surgical diseases alone, remaining ignorant of and indifferent to such relations as might exist between the eye and the general system,

¹Read before the Section on Ophthalmology, International Congress of Arts and Science, Universal Exposition, St. Louis, September 24, 1904, and reprinted from the *Journal of the American Medical Association*, November 26 and December 3, 1904.

except as regards those minor and few diseases which arise in the body and then affect the eye. Ocular inflammations, ocular operations, and the ocular results of systemic disease—these were the limits of its interests. Even in recent text-books on medical ophthalmology, there is no thought of any other relations of general medicine and ophthalmology than those morbid ocular ones originating outside. That the eye is the starting point of systemic disease was unsuspected. In the latest, greatest, best and most official text-book on medical practice, that of Allbutt, there is not a word from the first page to the last which hints at the ocular origin of any systemic disease, not even of headache. In the text-books of general medicine by continental authors, there is the same official ignoring of the claims of the new ophthalmology. In America also most of the text-books either ignore entirely, or, what is worse, list the remote causes of one or two systemic symptoms as possibly due to the eye, but so mechanically and inattentively as to turn the student aside more effectively than the silence of the utter ignorers. The "praise" is very "faint," indeed, with which they condemn.

The new ophthalmology finds its objects of study and interest precisely in those systemic results of ocular conditions. I do not mean in such ways as the circulatory or metastatic transfer of inflammatory or infectious diseases from the eye to other organs, nor to

the extension of localized inflammations to adjacent or even distant ones. That is another matter, and of it the old ophthalmology took sufficient cognizance. The field of study of the new ophthalmology is topographically well defined, its title clear, its methods, instruments of culture, the seed, and the crop itself, distinct, both genetically and evolutionally.

The abnormal conditions of the eye which set up morbid systemic results may, in strictness, scarcely be called abnormal, except by a strain put on the word. At least they are *per se* not morbid. They might better be called physiologically aberrant or variant. They do not originate in inflammatory or pathologic conditions, but simply in optical ones. But for us all physical optics leads to physiologic optics; primarily and fundamentally it pertains to the eye as an optical instrument, but as a living one, a physiologic camera obscura. If the photographer's camera had an elastic lens instead of a rigid one, and if its refractive power were spontaneously governed by the desire of the camera for an accurate focus of the picture, the analogy would be almost perfect. But the photographer's camera can neither direct itself nor renew its own sensitive plate, so that in spontaneous choice of scene, change of focus, and renewal of sensitive plate, the living camera is superior to the dead one. The natural difficulties of the choice of scene and of the resensitization of the plate have been beautifully overcome in the eye by the God

of evolution, but other obstacles have not been overcome. The ocular camera, for instance, is double and stereoscopic, and accurately to superpose the images of both cameras is frequently impossible even after ages of workmanship. As all physiology leads to pathology, so, for physicians, all physiologic optics ends in pathologic optics. The twelve ocular muscles have a highly complex and skilled task; hence heterophoria and strabismus. Moreover, the spontaneously elastic lens grows inelastic in forty-five years, and presbyopia, at least before the days of spectacles, was a frightful tragedy. Lastly, the transparent lens could not, formerly, retain its transparency in old age, and the blindness from cataract at the end of life has not yet been entirely prevented.

The chief difficulties of the mechanic of the living camera were to secure to 1,500,000,000 human beings and to their successors in each generation, eyeballs which did not vary more than about $1/300$ of an inch from a given diameter, and to make all corneas of the same radii of curvature in all meridians. These difficulties have been so great that there has probably never been such a mathematically perfect and optically exact pair of eyes in the world. Those chosen by natural selection, the elimination of the unfit and the mystery of heredity, to survive and to repopulate the earth have been such as were not so widely variant as to disqualify their possessors for work and service; and the major-

ity of their children, those now living in the world, have eyes so near accuracy in optical dimensions as to render their owners at least partly functional in the process of evolution.

This almost infinitesimal variant of $1/300$ of an inch, the thickness of a sheet of paper, in eyeball measurements, may throw the unfortunate possessor out of the struggle for existence, so far as perpetuation of the race goes, at least in civilized life, and for some occupations, or it may render him a most pathetic sufferer. I say it may do so, not that it does do this invariably or generally. The simple law is that the greater the ametropia the greater the certainty that it will do so, and the more limited the range and choice of occupations. The lower, not the positively lowest, errors of refraction, however, in civilization are they which in moral persons cause the greatest personal pain and suffering. The high errors brutalize, immoralize and exclude the owner from most occupations, the lower cause pain and illness.

Eyestrain is the unfortunate and inexpressive term that has come into use for the results that follow the attempt of the eyes, brain and correlated organs, to neutralize the defective function of the optically imperfect eyeballs and mechanisms. The optical defect is not morbid and has no relation to morbidity. It is at best pathogenic, secondarily or indirectly, not primarily. Its secondary effect—the straining of physiologic

muscles and nerve centers—is not in itself pathologic, but it illustrates, and best illustrates, the great truth which text-books, teachers and medical science itself are sadly prone to forget, that abnormal physiology is the origin of most pathology. Unnatural action and overaction start the morbid function which finally lands the physiologic on the postmortem table. To ignore this truth is itself pathologic pathology; to scorn it is to add unscientific sin to the symptom-complex of the scientist's disease.

It should be noted that as eyestrain is itself simply functional, not organic, so its results are at least primarily the same. Headache, the paroxysmal neuroses, many nervous and psychic disorders, epilepsy, chorea, migraine, sick-headache, gastric, digestive, and pelvic disorders, influenza, anemia, denutrition, etc., when due to eyestrain, are at first and essentially purely functional. Even those more severe diseases, such as spinal curvature, appendicitis and pulmonary and renal diseases, which are sometimes directly and indirectly the results of eyestrain, are at first characterized by a peculiar stage of functional and remediable disorder, preceding the organic, inflammatory and incurable one.

There are valuable lessons to be gleaned from the fact of the origin of eyestrain in optics, at once historic, physical and physiologic. There is the observation that medical science and pathology did not discover it. The science of physiologic and pathologic optics came to

medicine almost entirely from without. It is the gift of students of physics. Even when physicians busied themselves with it they did so purely from their interest in vision and clear-seeing, not from that of pathology. Astronomers, physicists, and opticians presented their gift to medicine. Even Donders had little or no thought of the extension of the practical science made by the practical American ophthalmologist. The earliest refractionists—we must use the word—more or less accidentally and incidentally discovered the facts of the relief of systemic diseases by their spectacles. The patients made the discovery that their headaches and nervous symptoms disappeared when they wore astigmatic lenses, and they came back and told the astonished and delighted oculists about it. Mitchell, not an oculist, heard the story from Thomson, and he told the profession about a little of it. The profession would not listen and utterly ignored it. For several hundred years the official profession would not even have anything to do with the spectacles which the non-professional invented. It allowed Franklin to invent the bifocal lens, and failed to adopt it for a hundred years. There are to-day neurologists, diagnosticians, and physicians of international renown who wholly deny that eyestrain causes reflex diseases of any kind. A special meeting of the New York Academy of Medicine was recently held in which great neurologists and ophthalmologists vied with each other in ridiculing the ab-

surdity. It is no wonder, therefore, if the stone which the medical builders refused should become the cornerstone of the temple of the opticians. These gentlemen naturally think they have a right to practice the art and science of refraction. Those who scorn the new ophthalmology would, in fact, reduce the refractionist to an optician. It is a costly blunder which the profession will resent and must unlearn, because refraction is a medical art and science in the strictest sense of the term, one requiring the highest intellectual qualities. Hence their claim can never be allowed, and the profession must, therefore, now wage a hundred-year war, which it might have prevented, against an enemy which it might have made a friend and ally.

What are the relations of the new and the old ophthalmology? They are most intimate, sociologically and clinically. In a word, the scientific correction of ametropia prevents almost all inflammatory and surgical diseases of the eyes—I should say about nine-tenths of them. It will not, of course, prevent the few ocular results of systemic disease, such as albuminuric and diabetic retinitis, optic neuritis, toxic amblyopias, etc., but such things are uncommon, and not seldom the systemic trouble had its individual grounding in morbid ocular function. The far greater proportion of all ocular diseases are those of the extrinsic muscles; inflammations of the conjunctiva, cornea, and iris; glaucoma; high and increasing myopia, and cataract.

As to the external muscles, there is now an almost unanimous agreement that heterophoria is due to uncorrected or miscorrected refraction anomalies, and that the plunge made into tenotomies, graduate, undergraduate, or post-graduate, was into a blind alley of error and waste which has done irreparable harm to true ophthalmology by making the professional and lay world suspicious and even contemptuous. The heterophoric trouble is innervational in nature and refractional in origin.

As to strabismus, the same truth is at last becoming manifest and admitted. A recent English book, Browne and Stevenson, on the "Squint of Children," is a striking proof. Get glasses on the child early enough and there will be no squint. Even when the fatal delay has been negligently permitted, the operation does not do away with the necessity for the spectacles, and there are some of us "extremists" who contend that the operation is of little or no good even at the late date.

With the exception of relatively few cases, due to trauma, infections, malnutrition, etc., conjunctivitis and keratitis are of eyestrain origin. When one sees a few thousand cases of spontaneous recovery after the patients get proper glasses the truth needs no further mention.

As to iritis and glaucoma, did any skilled refractionist ever see the disease appear in eyes which for years

previously had been fitted with right correcting lenses? It may be that such cases occur, but observation shows that the eye which is morbidized by eyestrain has such low resisting power that only a slight inciting cause is needed to develop the otherwise powerless hint.

Concerning retinal and choroidal diseases, it is also a truism that they are usually caused by the ciliary strain of uncorrected ametropia. The "woolly," hyperemic and suffering retinas, the "pepper-and-salt," unhealthy macules, the abnormal pigmentations, noted ophthalmoscopically as the result of long-continued eyestrain, are suggestive and characteristic.

There is one refraction-anomaly, high or malignant myopia, which is the direct consequence of disease of the eyeball. Does anyone now doubt that this, the stretching or stretched eyeball, is the result of ametropia? If so, he should go to Germany to live. And why does the lens so often grow opaque in the old? Why, it would be better asked, does it grow opaque toward the end of presbyopic failure? The suggestion comes that it is at least partly because of the denutritive conditions set up by the severe strain of presbyopia added to that of preexisting ametropia. This theory derives clinical support from the fact that cataract does not arise when the eye has been kept in an optically correct, healthy and physiologic condition for twenty years before the cataract-age.

And thus the good American motto, *e pluribus*

unum, applies to ophthalmology as well as to statesmanship. In the many diseases of the eye there is at last but one disease. There was plainly an overhasty recourse to surgery when the surgical disease could have been prevented. As has been well said, an ancient hunger for the miraculous has come down to our times and to our medical science, and operation is the modern medical miracle.

At last we have begun to see that prevention is better than cure, and the ophthalmic surgeon is becoming the refractionist. In the same way the ophthalmic therapist is disappearing to return immediately as the preventor of disease, the keeper of good eyes good. Therapeutics is fast merging itself into prophylaxis, and the practitioner of medicine is becoming the hygienist. It is a sort of benevolent suicide of the old ophthalmologist for the benefit of his heir, the well-insured new young man. It is fortunate that the new and the old science are in reality carried on in America by the same practitioners so that no rivalry nor ill-will can take place. For a time, to be sure, the dual ophthalmologist may privately discuss with his conscience the question as to whether he will undertake to prevent the strabismus of the little one, and the cataract of the presbyope, or operate later, etc., but in this and many other similar instances I do not contend that the old ophthalmologist is Mr. Hyde, although I am sure that the new one is Dr. Jekyll.

The unity of the organism and the interdependence of all functions is the dominating and moulding truth of medicine, the monism of physiology, the evolution principle of medical science and practice. No organ lives to itself alone; there is no function that does not influence every other. This is the truth which disallows a narrow specialism, prevents the exaggerator from becoming an extremist, and forbids the extremist to become a hobby-rider. In obedience to it the specialist must always be on the sharp lookout for all the lines of cause and effect which may subtly run back and forth, either way, between the diseases of his chosen field of study, and that of all the other specialists. We are, in truth, all of us, specialists nowadays, the general physician fully as much so as any other. While knowing profoundly one specialty, as willy-nilly we now must do, it is our common duty to maintain a keen outlook over the work of others and preserve a large sanity of mind, and a genuine sympathy of feeling with our collaborators in all other fields. The direction to speakers at this meeting is to choose out and emphasize the relations running between their specialties and those of others, between one science and the other sciences. We are to bind into unity, or preferably discover the number and nature of the existing bonds, which make the organism one and its parts interdependent, and which resolve all organisms into a universe.

The relations which exist between refraction anomalies and general medicine are almost solely of one kind—those, namely, in which the ocular condition is causal. There are few bodily conditions or diseases that influence the ametropia.¹ Large changes in general body weight, I have demonstrated, do so, a decided increase of fat tending to lessen the anteroposterior diameter of the globes; an extensive decrease of fat, conversely, lengthening the eyeballs. I have also noticed that after a severe illness refraction changes will probably be found. Other illustrations may be omitted.

When one turns to observe the number of organs and ways in which eyestrain results in extraocular disease, there is at once, of course, a recognition that, compared with direct ocular reflexes, they are few. The eye and ear have extremely few, if any, interdependencies, and they are relatively unimportant. And yet an expert might write an interesting monograph on the subject. One would say that the dentist and oculist had little in common, and yet I have had more than one patient who had violent toothache in sound teeth whenever he read or wrote five minutes.

The specialist in diseases of the upper air passages

¹ Although one well-known neurologist and one orthopedist have said that eyestrain is a result of the systemic disease, rather than the reverse—an amusing betrayal of a lack of knowledge of what ametropia is!

must never forget the oculist. It is a significant fact that eyestrain patients locate their headaches directly in or behind the frontal sinuses. We list them as frontal, but understand thereby that the forehead is the location of the pain. For many years I had noticed that there was a suspicious relation between eyestrain and frontal-sinus disease, and in several patients I had definitely traced it. Dr. Phillips of Buffalo has made a close study of ten such cases in which the sinus disease was clearly due to eyestrain.¹ Reflex congestion of the upper air passages, pharyngitis, laryngitis, aphonia, common colds and influenza, may be due, and more frequently than is supposed, to eyestrain.

In general surgery nothing, a short time ago, would have seemed more absurd than to say that eyestrain could at least prevent appendicitis, surgical diseases and operations. Yet Dr. Robert T. Morris, of New York,² whose character and professional standing need no setting forth, writes as follows:

"A very large group of cases of intestinal fermentation is dependent on eyestrain. These cases are perhaps quite as often overlooked as any others, but as soon as we have all become familiar with the external signs of eyestrain fewer cases will get to the surgeon with the diagnosis of abdominal disorder. Those that I see are sent to the office most often with the request to have the appendix examined, because the distension of the cecum is apt to cause more pain than distension of other

¹ *American Medicine*, 1904.

² *Medical Record*, December 26, 1903.

parts of the bowel and attention is attracted to this region. If there are external evidences of eyestrain these cases are referred to the ophthalmologist, along with my cases of 'nervous dyspepsia' and 'gastric neuralgia,' and some of the most brilliant results that I have observed in any kind of medical practice have come out of the treatment that was instituted."

If an oculist had first made such a statement the grin of derision would have extended across the face of the continent. Because the general surgeon thus annually turns away from his office thousands of dollars' worth of operations, it derives at least the merit of unselfishness.

There is no truth in medicine more certain and demonstrable, although the gastrologist has not heard of it, than that eyestrain produces anorexia, denutrition, intestinal fermentation, constipation, and many disorders of the digestive organs, including, especially, the liver. If so, it is, of course, admitted that the surgical diseases secondary to such disorders may be ocular in remote origin, and the warning may not in the future be safely unobserved by the appendicitis specialist, the gastrologist, the gynecologist, etc. Within a year a famous medical journal has editorially stated that all obscure gastric symptoms demand operation to discover and excise a possible gastric ulcer. That is, surely, surgery gone mad.

In orthopedic surgery a new causal relation has most recently been discovered between eyestrain and spinal curvature. Scoliosis begins in childhood and adoles-

cence as spinal curvature, and in thousands of patients the spinal disease is unsuspected by child, parent, and doctor. Within a few months I have discovered thirty or forty cases of tilted heads, most of which caused or might cause secondary or compensatory scoliosis, and all due to an axis of astigmatism (about fifteen degrees unsymmetric, and to one side of 90 degrees or 180 degrees in the dominant, that is, the dextral eye in the dextromanual), which compelled a habitual lateral inclination of the head in order to see plainly. And the compensatory curvature of the spine induces a score of other systemic diseases. We formerly allowed our patients to tilt the head while making refraction tests, and so missed locating the astigmatic axis correctly.¹ By keeping the head vertical during the testing we now apply glasses that keep it straight afterward, and when the spinal curve is still functional we likewise straighten it by glasses alone.

No pediatricist henceforth may forget the eyes in all of his patients over eighteen months old. The chances are high that, without other definite and easily ascertained cause exists, eyestrain is the source of the mischief in the child which suffers from night-terrors, breakfast anorexia, tics, chorea, nervousness, disorders

¹ An excellent rule of ophthalmic office practice is that when we fail to cure eyestrain results by our glasses, it is perhaps because we have allowed the head-tilters to hold their heads as they pleased during the tests.

of digestion and nutrition, irritability, headache, etc. I have cured nocturnal enuresis in children by spectacles alone. Alert-minded pedagogs are fast becoming aware of the tremendous role of eyestrain in the health and success of their pupils. As every year of school life passes the proportion of diseased pupils increases, until in the upper grades it may rise to 60 percent; it is 40 percent on the average in Columbus, Ohio. The diseases are precisely those which every capable oculist knows are often due to eyestrain. The rule is so certain that discerning teachers know that those pupils who are one, two or three years behind their classes, have severe eyestrain, and without further inquiry they are sent to the oculist. There is hardly a page of that magnificent book on "Adolescence," by Dr. G. Stanley Hall, that does not need rewriting with this new knowledge—unfortunately and strangely ignored—in the mind of the writer. Its splendid power and truthfulness could have been doubled had its gifted author looked into the vast existing literature, written by capable and scientific minds, confirmatory of the role of eyestrain in school life.

In neurology there is almost no limit to what the refractionist may justly claim. And posterity will allow it, although the neurologist of to-day is unconscious and contemptuous of the truth. Neurasthenia and hysteria he claims as his exclusive possession.

Private sanitariums or rest-cure establishments may be of limited and infrequent service for chronic patients whose vitality and resisting powers have been worn to a thread by a half-life of torture for which no therapeutics availed. But even the ordered rest-cure could often be avoided by correction of eyestrain, and in perhaps 75 percent of cases the neurasthenic breakdowns and chronic hysterias could have been prevented by attention to the matter in adolescence. Not infrequently it is plain that the resting is curative because the eyes are rested. With reading and writing interdicted there are often astonishing cures; with resumption of reading and writing, relapses and returns to the sanitarium are required.

Every sensation and its every correlated motion is an example of reflex action, and yet there are those who airily scoff at the very possibility of reflex neuroses, and other diseases due to reflex action. There are those who speak scornfully of mysticism and mystery in medicine, while satisfied with a practice which reduces itself to diagnosis and naming unknown mysteries as migraine, neurasthenia, hysteria, psychosis, etc.

Psychiatry seems to have reached the goal of its ambition. Diagnosing and naming a morbid mental condition as "a katatonic state," "major psychosis," "melancholia of involution," "psychical tonus or contracture," "dementia precox," "*forme fruste*," "manic depressive insanity," "confusional psychosis," "pseu-

doneurasthenia," "mysophobia," "topoalgia," "neurasthenical syndrome," etc., all of which terms are culled from one short article, seems to end in the air so far as bettering conditions. Logomachy does not help. Who has examined the refraction of the insane? What patient with extreme eyestrain or migraine has not feared insanity? The sanest of men, Parkman, was pronounced insane, and so was Wagner and others, by great authorities, at the climax of their sufferings. Was not Nietzsche's "atypical paralysis" intimately connected with his most evident eyestrain? A competent oculist finds the majority of the young criminals of the Elmira Reformatory afflicted with so high a degree of ametropia as to make study, reading and writing and ordinary handicrafts impossible. What else could many of the poor boys do but play truant and steal? The statistics showing the relation of crime to truancy indicate that some of both may be due to bad eyes.

In 252 cases of suicide, 187 were due to ill health. About 50 percent of chronic epileptics have unsymmetric astigmatism and anisometropia—a surprising ratio of a defect especially prone to upset the cerebral health and balance. The peculiarity of the diseases of eyestrain is their tendency to produce psychic and emotional disorder, despair, melancholy, etc.

There is scarcely any disease which the general physician or internist is called on to treat that may not

be and that frequently is not due to or influenced by eyestrain. The commonest is designated by that silly and meaningless word, migraine. The term has little or no significance nowadays. It is, in fact, the vulgarization of a misnaming and meaningless designation of a malobserved and trivial symptom, which in the majority of cases is not present, of a widely prevalent and ingravescent disease, with indescribable symptoms, which may, in extreme cases, wreck life and morbidize the mind, the etiology and pathology of which are unknown, the location or organs affected being also unknown, and of which no treatment avails. It is made to cover the conditions indiscriminately called scotoma scintillans, headache, sick-headache, gastric and intestinal disorders, insomnia, melancholy, etc.; in a few severe cases such patients have all of the symptoms. It is almost always due to eyestrain, and, except in the rarest worn-out chronic cases, it is almost immediately curable by relieving the eyestrain. It is the commonest of all affections, the great manurer of the ground for other and terminal diseases, the supporter of quacks and patent-medicine syndicates. From 10 to 20 percent of Americans suffer from it, under one alias or another, recognized or unrecognized. The larger number of these, taught by sad experience, have given up the hope of cure, and they are neighbors of the person who says migraine has no relation to eyestrain, and who does not know that

thousands are now being cured by two little pieces of glass. Eyestrain effects have a peculiar tendency to periodicities and waves of better or worse. The nervous centers can endure for a time the burdens and irritations laid on them, but at last give way. This is so of mental states and diseases, and the eye as psychologists know is the chief creator of intellect. Hence those diseases or symptoms when not dependent on organic disease, like headache, sick-headache, fickle appetite, the paroxysmal neuroses, cardiac palpitation or irregularity, chorea, epilepsy, neuralgias, insomnias and colds, which exhibit such waves of exacerbations and depression, may be due to ocular irritation.

. A key to many mysteries of disease might be found in a careful classification of such as have increased with civilization as compared with those conditions outside which have been changed during the progress of civilization. Among these changed conditions none can be more noteworthy than the new kind of labor, and the tremendous addition of the amount of it thrown on the eye by the printing press, schools, sewing, clerical and urban life. No other organ has been subjected to such a change of work and stimulus, and in all other functions the same kind of work is now demanded as before. The eye, however, was brought into function to use in distant vision, and if for near, for but an instant. Osler says that dyspepsia is the

besetting malady of this country, due to improper diet, etc., although modern food is many times more certain in amount and good in quality than ever before. It is certain that stomachic and nutritional diseases seem to have increased inordinately. What is the cause of this contradiction? One, surely, is eyestrain, which is extremely prone to upset the digestive function. See several thousand cases of nausea, "dyspepsia," loss of appetite, constipation, etc., relieved at once by glasses, see the disease return at once when the glasses are broken, a lens reversed in a frame, or when the refraction changes, and one recognizes the fact of the interrelation. Allied to this class of cases are those in which the keen ophthalmologist detects more than hints that renal affections, hepatic ones surely, including gall-bladder diseases, may possibly be set up or aggravated by severe reflexes from the eyes to the secretory and eliminative organs. Some day it will be established that eyestrain is a large factor in the production of diseases of the kidney.

One of the more subtle but still easily recognizable methods in which eyestrain works perniciously is by a slow and general denutrition and reduction of mental and physical vitality whereby the resisting powers of the system are reduced to such a degree that it becomes the easy prey of infections, and of general and terminal diseases. This makes eyestrain a factor in the tuberculosis and pneumonia crusade. The life study

of patients and their diseases—the biographic clinic—will make such a connection more often manifest. The sad story of the life of John Addington Symonds is in this way suggestive.

The age-long superstition whereby almost all the diseases of women were traced to the sexual organs and functions,¹ is fast giving way to a new view more in correspondence with facts. That puberty and menstruation should inaugurate a host of terrible evils, and the menopause another legion, is at the least contradictory. The proper name for the cause of many supposed disorders of menophania and puberty is study with astigmatic eyes; that for supposed menopausal woes is presbyopia. In a large number of instances *ὀφθαλμός* may replace *ὀστέρα* as the organ primarily at fault. The oculist and gynecologist should be good friends. The connection between the eye and sexualism is known of old, and is a deep and profound one. Love of any and all kinds dilates the pupil, the designation of the grand sympathetic system itself arising from the fact. A certain profound relation of vision and sexualism will sometime be established which as yet is unsuspected.

Justly motivated, therefore, is the question: Why has this great truth been so long ignored, and why now do so many reject it? Some of the answers are these:

¹A sad error that much mars the large sanity and lessens the benefits of Dr. G. Stanley Hall's great book.

1. The progress of science has not yet reached the stage that will enable certain minds to see its truth.
2. The conditions of life and professional evolution have made surgery of supreme importance.
3. Organic diseases had first to be studied.
4. The laws and status of infectious diseases had first to be made definite.
5. A mere habit of neglecting the eye and its all-important function and diseases has with some grown into a blind dogmatism.
6. The theory of optics, and the elaboration of mathematical formulas, satisfied too many minds, and there was no proceeding to the practical application in clinical work.
7. Specialists in medicine, other than ophthalmologists, have overstated the effects of the diseases of special organs.
8. The ophthalmic tenotomist has made unwarranted claims and so made the profession blind and deaf to the warranted claims of the refractionist.
9. The commercial medical journal plays to the galleries, and flatters the prejudices of its readers.
10. Patent medicine vendors, drug-sellers and quackery within the profession carry on the irrational tendency.
11. Suffering and pain are positive, relief and cure negative. The patient, therefore, is prone to forget the primary misery, nor does the physician recognize

the cause of the cure by glasses, which is ascribed to fate, *gale répercutée*, the doctor and his drugs, etc.

12. The method of eliciting symptoms and of clinical note-taking is so faulty that the very existence of the chief symptoms of eyestrain is not recognized. The patient thinks the vomiting, abdominal symptoms, migraine, headache, dyspepsia, insomnia, loss of energy, etc., have no possible connection with the eyes, does not allude to them, and they are thus wholly ignored. Thousands of such have been cured by glasses, and the fact unsuspected by either physician or patient. In another, less large, number of cures the method of cure is known or suspected by the oculist, who is silent concerning it because of the desire to "stand well with the profession," or to secure reference cases from those physicians and neurologists who disbelieve in the "extremist" and all his work.

13. The desire for consultation practice, referred cases, professorships, hospital positions, and "success" make the cunning silent or conservative. "Faddism" and "hobby-riding" charged to a budding reputation are ruinous.

14. Poor refraction work on the part of oculists is the greatest cause of scepticism. Those who do accurate refraction know perfectly well that, broadly speaking, the ophthalmologists of the world have done their refraction work badly. The logical and pathologic conclusions of the labors of Donders, Helmholtz and

others have been practically made only by some American and one or two English refractionists. "I sent my patient to the oculist and glasses had no effect on the disease," means utterly nothing. "Is not my oculist a man of the highest renown and ability?"—may mean as little. Does this man of renown and ability teach, and in the persons of his patients demonstrate that so-called "migraine," headache, sick-headache, dyspepsia, spinal curvature, insomnia, neurasthenia, anemia, the blues, and the rest of the list, are often, very often, due to eyestrain? Belief in the truth is a prerequisite of ability to cure; and is absolutely essential to a rigid attention to at least "seventy-eight reasons why glasses failed to give relief." From 50 to 75 percent of glasses prescribed in the world are inaccurate and can not relieve eyestrain. Then it is also true that fully 90 percent of the adjusting of opticians is so bad that any possible therapeutic result is not obtained.

To be entirely frank one should add an argument which is, indeed, a two-edged sword, but which needs occasional use to keep it from rusting. It is this: Those who deny that migraine and the many other diseases mentioned may be due to eyestrain have not of course cured such patients in their own private practice. That is a self-judgment which is most severe. Those on the other hand who claim that such diseases are curable by ametropic correction, unless utterly un-

professional, must have cured such patients. If they do not cure they would surely be soon found out and their reputations and practices ruined. They seem to prosper! I heard one astute oculist say that if this absurd scepticism continued a few years longer his fortune would be made. He is very "successful" and is conducting his work in an honorable manner. The enthusiasm and gratitude of a patient permanently relieved of the tragedy of "migraine" or "neurasthenia" is irrepressible.

A corollary is that refraction is not taught, there is not a single adequate and thorough-going school wherein may be taught, or wherein there is any out-fitting, or attempt to teach, this most skilled, most infinitely subtle and difficult art and science. Two years at least of study, daily, exclusive study and practice, after the general course in medicine, under expert teachers, and on the part of the best type of student minds, is a too short period to introduce a man to the work, and to legally justify him in entering on such specialist practice. An endower and maker of such a school would do the world a greater service than either Carnegie or Rockefeller have so far dreamed of doing.

Again the critic may justly ask: "Have none, then, recognized and spoken out this much unrecognized truth?" Oh, yes, many and good men have done so. There is a vast quantity of literature produced by clinicians of the best character and professional standing,

and it is astonishingly convincing and cogent. It is unfortunately scattered, and hence, in part ignored by too many physicians. The last weighty utterances are Dr. Zimmerman's study,¹ and especially since they are from England, the excellent reports of Dr. Snell,² and Dr. Pronger.³ Hundred of others might be cited, the testimonies, *e. g.*, of such good professional journals as the *Cleveland Medical Journal*, the *St. Paul Medical Journal*, the *Lancet*, the *Pacific Medical Journal*, *American Medicine*, the *Maryland Medical Journal*, *Colorado Medicine*, *Science, Mind*, the *Harvard Graduates' Magazine*, *Bulletin of the American Academy of Medicine*, *Canadian Journal of Medicine and Surgery*, *Dublin Medical Journal*, *Medical Press and Circular*, *Bulletin Chicago Health Department*, *The Practitioner*, *The Nation*, *Wisconsin Medical Recorder*, *Quarterly Medical Journal*, *Treatment*, *California Medical Journal*, *Medical Bulletin*, *Medical Council*, *The General Practitioner*, etc.

Of individual opinions a page of names could be easily cited, of men with good professional reputations, acquired and to be preserved, such as, for instance, Drs. Jackson and Bates of Denver, Edes of Boston, Southard of San Francisco, Hurd, Reik, Murdock,

¹ *New York Medical Journal*, November 21, 28, 1903.

² *The Lancet*, April 30, 1904.

³ "Slight Errors of Refraction and Their Influence on the Nervous System," Harrogate, R. Ackrill, 1903.

Welch and Halsted of Baltimore, Senn, Westcott and Walker (J. W.) of Chicago, Baker and Sherman of Cleveland, Cheney of Boston, Alleman and Prout of Brooklyn, Carmalt and Swain of New Haven, Coggin of Salem, Mass., Bennett, Starr, Pohlman and Phillips of Buffalo, Risley, Pyle, Thorington, Hansell, Reber, Zimmerman, Solis-Cohen (S.), Thomson, Fenton, Murphy, Talcott Williams, Hollopeter, etc., of Philadelphia, Callan, Ramsey, Carhart, etc., of New York, Van Duyn and Marlow of Syracuse, Taylor of Wilkesbarre, Würdemann and Black of Milwaukee, Roberts of Pasadena, Ellis and McBride of Los Angeles, Hale of Nashville, Matas and Souchon of New Orleans, and especially the dean of American ophthalmologists, Dr. Green of St. Louis, who for nearly fifty years has been refracting patients and observing the results. I append in a footnote¹ extracts from a personal letter

¹ *Dear Dr. Gould:*

I have read your two volumes of "Biographic Clinics" with great interest, and have gained much instruction from them. I regard them as a very important contribution to a just appreciation of the distinguished men and women whose lives you have so sympathetically studied.

The fact that the commonest ocular defects may give rise to morbid states, such as you have depicted, has impressed itself on ophthalmic specialists before it was recognized, and urged on the medical profession in the classical essay of Dr. S. Weir Mitchell, *American Journal of the Medical Sciences*, April, 1876. In the nine illustrative cases reported in that paper the trains of distressing and disabling reflex symptoms clearly

written by Dr. Green because of its peculiar appositeness.

As optics grow into physiology, and physiology into pathology, so must our pathology merge into biology. How is eyestrain related to the evolution process of living things? The test of the validity of all medical truth, and distinctively of that we have been empha-

parallel those analyzed by you in the fourteen biographic clinics, but with this difference: In his cases the dominant etiologic factor was discovered before irreparable damage had been done, and relief followed the timely prescription of appropriate glasses; in the lives which you have discussed, relief came only in advanced age, when accommodation ceases from troubling.

To me the central and very significant fact is that the prostrated sufferings, always alleviated by rest from eye work and always recurring with the resumption of studious pursuits, as portrayed in the several biographies from which you have culled, are such as ophthalmic practitioners recognize as dependent, in many persons, on common ocular defects, and as preventable or curable by properly directed optical treatment.

It cannot be too strongly impressed on all intelligent persons, whether physicians or workers in other fields, that the demands made on the eyes in modern life are much greater than the visual apparatus, when of only average structural perfection, can meet effectively and safely. The lesson which I have learned from forty years of continuous study of the anomalies of accommodation and refraction is precisely in the line of your teaching, namely that no degree of anisometropia or of astigmatism can be regarded as too small to demand accurate correction in persons compelled to use the eyes continuously, or in patients suffering either from so-called asthenopic symptoms or from headache or other reflex disorders induced or aggravated by eye work. Neither can I accord any

sizing, is its function in the great incarnation process summed up in the Bible, verity, "The Word became flesh," and in the consensus of doctrine in the term, Darwinism.

A truth none can deny, but one which all biologists have ignored, is this: Vision is the dominant condition of self-motility. Wherever there is an animal that

measure of assent to the notion that a short term of attendance at a post-graduate school, or any period of apprenticeship in selling eye-glasses and spectacles, can qualify an uneducated or, at best, a crudely educated man to do work which often taxes my own powers to the utmost, and in which I find that the continued cooperation of the patient, by returning promptly for further advice when anything goes wrong and by permitting the necessary periodical revision of his optical correction, is indispensable.

It is surely not an extravagant contention that eyes which do not perform their function perfectly in all respects and under all conditions, or whose use is attended or followed either by local disturbances or by headache, nausea, insomnia or other reflex manifestations, ought, without exception, to be promptly and critically examined. That such examination will very often bring to light a previously unrecognized ocular defect, and so point the way to urgently needed relief through wearing properly chosen and properly adjusted spectacles, needs only to be stated to command assent. The knowledge that relief from headache may come through wearing glasses is becoming more and more widely diffused; but comparatively few physicians have learned, as yet, to recognize the protean forms which reflex disorders of ocular origin may take on, or to estimate at its true value the service which a wise and conscientious ophthalmic specialist may be able to render.

The investigation and treatment of functional disorders dependent on structural imperfections of the visual organs call

moves, in the light, there are eyes. *Ubi motus ibi visus*. There could not have come into being any except the very lowest animalian organisms unless through the visual function. All nutrition, all safety, all attack and escape, all free-moving and effectual doing, was utterly and wholly by means of seeing. Thus the evolution process was dependent on and made possible only through the evolution of the eye, both as a precedent and conditioning *sine qua non*.

for the exercise of the minutest care, and often of almost infinite tact and patience. That three essential qualifications are sometimes conspicuously lacking in men eminent for their achievements along other lines is also true. Careless or perfunctory refractive work by an ophthalmic specialist will yield no better results than similarly defective work done by persons of inferior scientific attainments and of vastly less reputation. The intelligent and painstaking pioneer work of Ezra Dyer; the invention and employment of new aids to diagnosis by William Thomson; the frank recognition and just appreciation by S. Weir Mitchell, of the far-reaching benefits rendered, in his reported cases, by William Thomson, William F. Norris and George C. Harlan; and lastly, the continued devotion to the cultivation of accurate methods by a long line of careful investigators down to the present day, make up a sum of achievement by Philadelphia men which may be regarded as more than sufficient to justify the recognition of a distinctive Philadelphia school.

The personal sufferings of Ambrose Paré and of Percival Pott were the means of enriching surgical literature by two illuminating chapters on compound fracture. Your early experience of the torments and disabilities incident to a too long delayed diagnosis and connection of a complicated ametropia gives you, also, the right to speak forcibly and with authority.

Were not the Hebrew prophets decried, in their day, as enthusiasts?

JOHN GREEN.

And few have the most dim notion of the complexity of the organ of vision in man, or of the amazing difficulties of "Biologos" in fashioning and perfecting it. Millions of finger tips are bunched together in the one-inch cup of the eyeball, from whence run about 425,000 nerve fibrils to a topographic mechanism of sensation in the occipital lobe. The eye can see an object $1/1000$ of an inch in diameter. The cones and rods are only $1/10,000$ or $1/14,000$ of an inch in diameter, and a million cones at the macula occupy a space of only $1/10$ of an inch square. These crowded finger tips perceive the shape of the picture and the intensities of the light stimuli of all illuminated objects of a millionth of a millionth of the kinetic energy of any other physiologic force, and of so short a duration as the 0.00144 of a second. And out of these infinitesimal waves the sensations called light and color are created. The mechanism which creates them must be in intimate and instant connection with the centers initiating and controlling every other sensation, of every motion, of every muscle of the body. Imagine for an instant what takes place in every animal and human being every day of its existence. A traveler tells of a monkey pursued by another, and running over and through the tops of the trees of an African forest faster than a deer could run on open ground. The flashing repetitive momentary glances of the eyes, before, back, and all about a hundred objects must be

coordinated with a mathematical precision to accurate unity and brilliant action of every muscle of the body. Similar perfection of eye and motion has been evolved in every higher animal of the world, and in every savage, and in every child. Your horse avoids all stones and knows, unconsciously, every inequality of the ground before and beneath him by the like mechanical unity. Watch little children in play barely missing obstacles and dangers which would mean injuries and perhaps death with swift unconsciousness. The history of savagery and of civilization is all there and is of the same nature. See with unbelievable accuracy if you would succeed, is the first verse of the biologic decalog. That is the physiologic Logos which became the biologic flesh.

But see inaccurately and you die, is the antithesis, and the animal which failed to obey perished, inevitably and quickly. The savage did the same, your horse that stumbles is useless, your playing child that hits its leg or trips becomes, at least, a very different child, and a very different man or woman from the others who do not make these visual and coordinating blunders. Such are the backward scholars in school and, in large part, they are your failures in life, society's expensive degenerates, defectives and dependants. They are rapidly increasing in number with every step in civilization, because every such step means the entangling difficulty of added near vision,

All of which—and this is the heart of the matter—Darwin, a martyr to bad eyes himself, failed to see, and all of which no evolutionist has since caught sight of. And yet it has been one of the large controlling conditions of the evolution process. For not only has this unity of mathematic optics and physiologic function been the inescapable method of success in the struggle for existence, but it has been the chief mechanism whereby the so-called unfit have been thrown out of the count. Visual imperfection has been and is increasingly becoming one of the dominating causes of the exclusion of the ontogeny from the propagating phylum. This is the fundamental distinction which differentiates the laws of biologic evolution and survival of those with and those without vision. It is the key which will unlock and reveal many of the profound mysteries of heredity and descent which to-day are tormenting the different schools of evolutionists and biologists. Open the door and walk into the long-closed ancestral hall and the mystery of forbear and after-comer is revealed. How and why we are here is at once plain. None could have been, and we could not now be the link between the phylum of the past and that of the future, except on the condition of seeing well. Those not allowed to become such parental links were largely those who saw too inaccurately to compete in the beneficent but summary process.

Note well, however, two things: The most perfect

organism in the past world of animal and man was useless without, first, this perfection of visual function, cerebral coordination, and muscular response; and, second, the attainment of this optical mechanism was far more transcendently difficult than any other physiologic task. To attain transparency and nourishment of cornea, lens, vitreous humor and retinal end-organs, to superpose the images of the two eyeballs, to respond to the almost nothing of stimulus, to transmit to brain, to manufacture sensation, to dominate all other cerebral function, instigate and direct all motion—where is the end of the marvellous task! The end is in failure to do any one of these things, and to make that inch-in-diameter eyeball of a spheric perfection which shall not vary by $1/300$ of an inch from the normal. The end is not to have prevented conjunctivitis, traumatism, keratitis, iritis, glaucoma, cataract, retinitis and other multiform diseases, prone especially to occur in the astoundingly complex and refined organism. The pathology of animalian evolution has therefore been in large part the pathology of vision. The organism otherwise perfect except as to an infinitesimal visual part is thrown out by this optical necessity. The mechanism *per excellence* of the exclusion of the unfit is thus made clear.

To this now add the consummating and crowning function of vision—the creation of intellect. Psychology, history, and biology unite to demonstrate that the

objectivation of the *ψυχή* of civilization is almost uniquely by means of vision. The greatest task of all human history was the creation of the letters of the alphabet. It was so difficult that only one race did it, and within one of two millenniums all others have come to a knowledge and use of civilization only through the adoption of the invention. No writing and printing, no civilization. But the letters of the alphabet are conventionalized symbols of pictures, or things seen. Add to this that language itself is of identic origin. There has been no speech except to express the result of ocular function. Almost all psychology is summarized as handlings, coordinations and deductions of visual images, of these and of the motions made possible by sight. Thus every cerebral function, perception, apperception, feeling, most of it, and willing, that which is effective, surely reasoning and judgment—all spring originally and constantly, are bound up with, dependent on, and interdependent with vision.

There is something more than mere imagery and fancy which analogizes the course and phases of these developmental stages to the way of water-flow in the world. Decidedly optical are the sun, cloud, rainfall and snowfall on the uplands and mountains whence spring the crystal streams and rivulets of physiology. In them optics become function and action, physics become physiologics. The lower falling brooks be-

come discolored and morbid when they reach the homes and degradations of man—physiology becomes pathology. But the stream broadens into the large river of biology with the commerce, the health and unhealth of a continent, until finally the Mississippi sweeps to the mothering ocean of sociology where sail and steam the navies of the world.

Thus all routes and efforts lead to man, all biology ends in sociology. Our striving is for human betterment; because all medicine is preeminently philanthropic. The beclouded or befogged mariner orients himself by means of an optical instrument, and as the sun and the sun's winds bear the sun-made clouds back to the faraway mountains again, so vision and optical eyes and instruments again complete the morbid and therapeutic circle, the cure which is always beginning and never complete.

My contention is that here is a great means of civilization. It is a profoundly important thing that the hopeful Carlyle of the "Characteristics" should have become the pessimist of "Shooting Niagara and After." It is civilization's tragedy that Nietzsche should have had havoc played with his mind by eye-strain; that Huxley should have been driven from work at the height of his powers; that DeQuincey should have been an opium eater; that Darwin should have been able to work but two hours a day with his eyes, and Parkman but a few minutes; is it not a sad

thing that George Eliot and her books, Symonds and his great opportunity, Twain and his great scholarship should have suffered as they did? Is it not a pathetic source of social misery that 10 or 20 percent of eyes are incapable of sewing, typewriting, book-keeping, lathe-work, studying, draughting, and a still sadder thing that their owners have no knowledge of the fact, and that they should suffer until "break down" comes? Is it not an awful thing that from 40 to 60 percent of all school children are sickly? That suicide is increasing, insanity and epilepsy incurable, hospitals multiplying—and taxes, and prisons, and war, and want? A certain, perhaps a large, percent of all these backward school children, epileptics, prisoners, insane, hysterics, neurasthenics, dyspeptics, have such eyes that glasses correcting their optical defects would bring them much relief, would often have prevented much or all of their tragedy. And the proof is this: Put any pair of such spectacles on any one of us, and within an hour there would be headache, giddiness, vomiting or intense suffering. The cynics and skeptics of "eyestrain exaggeration" can be speedily converted whenever they are earnest enough to try a simple experiment on themselves. It is a truth awful in its significance that in civilized countries there are millions of people who are good products of the evolutionary mill, who have sound minds and good bodies, but who are partial or com-

plete failures, always with intense personal suffering, simply because of an infinitesimal malcurvature of the cornea, a too long, or a too short eyeball, no greater than the thickness of a sheet of thin paper. It is the little thing that, overlooked by others, makes or mars all undertakings, all sciences, and all cosmic proceeding. The compass guides the ship, and without it there would be no civilization as we see it. Without vaccine virus there would be a different world, there could hardly be civilization, and yet it was a generation after farmer Jesty inoculated his family from the teats of the cows in the field before even Jenner dared do the same, and before the best of the profession would have anything to do with it; and to-day there are perhaps a million antivaccinationists in America! When Pasteur had demonstrated what Villemin and Davaine had before said was true, the bacterial origin of some diseases, history records that "the doctors, in the great majority, were violently opposed to the germ theory of diseases. They answered experimental proof with oratory. The less excited among them urged temporizing. The surgeon Chassaignac warned Pasteur that laboratory results should be brought out in a circumspect, modest and reserved manner, etc." In 1843 Dr. O. W. Holmes conclusively showed that puerperal fever was contagious. We ignored the fact. In 1846 Semmelweiss of Vienna independently proclaimed that puerperal fever was due to inoculation by

nurse, midwife or doctor, and that this contagion could be prevented. For this bravery and clinical acumen Semmelweiss was persecuted by his medical brethren, turned out of his professorship and ruined. In the Paris Maternité Hospital in 1856, 64 women died of the disease out of 347 admitted. In 1864, out of 1,350 cases, 310 died. At last in 1874 Fournier and Budin introduced the "new" views of Pasteur and Lister, and in spite of what Dr. Roux calls the "tyranny of medical education," they were accepted, and puerperal fever disappeared. Would it not have been an inestimable gain not to have persecuted Semmelweiss and instead to have examined and tested his theory? In 1888 Dr. G. Martin stated that "migraine" was due to astigmatism and published proofs. In 1903 and 1904 the *Medical News* likens those who say the same thing to Dowie and Mrs. Eddy, and the leaders of the New York Academy of Medicine call a special meeting in order to snuff out of existence the advocate of such a senseless theory. And yet migraine is due to eyestrain as any one can prove whenever he wishes, and as thousands of patients will testify whenever asked. Migraine is peculiarly a disease of civilization, increased with every added hour of near-work with the eyes; and civilization is enormously increasing that constant strain of near-work with eyes evolved during millions of years for a different function.

There is hardly an instance in all history of a great and beneficent medical discovery that was not either ignored or hated and scorned by the official leaders, and by the great part of the entire profession. It was so with vaccination, with anesthesia, the germ-theory of disease, Mendelism, thoracic percussion, ovariectomy, antiseptis in surgery, the etiology of yellow fever and malaria, the serum treatment of diphtheria, Pasteur's antirabies inoculations, the humane treatment of the insane, etc.

Now the amazing fact about all of this is its ease of proof or disproof, the passionate hatred with which was rejected a possible source of relief of human suffering, the harmlessness of the trial, the utter forgetting of the patient, the supreme interest in the prejudice. Vaccination is harmless and its protective effect easily demonstrated. To tap the chest with the finger is a very simple proceeding and the sounds elicited are easily recognized. It is not difficult, if so minded, for the nurse, midwife and doctor to be clean, and thus test if puerperal fever is contagious. The physicians who clamored against railway travel because it would make passengers sick, giddy or insane, and said if the foolish would build railways board fences must be built above the height of the cars—these physicians could have got on the cars and disproved their theory. The opposers of the theory of circulation of the blood might at least have tested the theory by pricking their finger. The

prejudice against rabies inoculation, the diphtheria antitoxin, the mosquito-theory of malaria, and yellow fever, etc., which resulted in untold deaths and delay of scientific progress, could have been easily tested. It is childishly simple to test the power of astigmatism to produce or cure migraine, and yet many prefer not to make the test.

There are probably not a half dozen hospitals or ophthalmic clinics in the world outfitted with a trial-frame or set of test lenses that would enable even an expert refractionist to diagnose ametropia with the perfect accuracy which is necessary to cure morbid ocular reflexes. But those set to do refraction work in the public clinics are not expert. They are the students and learners. Hence nine-tenths of the glasses prescribed in these institutions are not correct. Ophthalmic surgery and inflammatory diseases are all that interest, and these would be largely preventable by the refraction that is neglected and misdone.

Even in the institutions for the blind it has been found that some of the inmates are not blind, and that their remnant of vision may be so vastly improved as to make these dependents self-supporting. In every school of the world at least 20 percent of the pupils are suffering from ill-health due to imperfect eyes, and yet pedagogics, except infinitesimally and incipiently, does not know and does not care. The teachers and professors in preparatory schools, colleges, universities,

technical and other schools, pay little or no attention to the ventilation of the rooms, or to the refraction of the eyes of their students. These are constantly breaking down in health, or in study, from migraine, etc., and the general scholarship is vastly depreciated because of the neglect of the eyes. An official and resident expert refractionist would make a university outdistance its rivals more than does all its "athletics."

In every asylum for the insane some patients are there because of bad eyes—and if only a few are curable of the chronic disease, many could be relieved of the headaches, gastric and other nutritional diseases which burden the attending physicians and the taxpayer. In one great institution for epileptics, a little experiment with glasses, imperfectly executed in many ways, showed a greater percentage of cures, a greater reduction in the number of seizures, than by all other methods of cure combined that had been tried in the institution. And yet the official report characterized the experiments as "disappointing," and sneered and misrepresented it. Epilepsy, it has been demonstrated, is in many cases due to ametropia; many cases could be prevented by proper glasses in the child, or during the early history of the case. In the chronic, severe and hopeless cases it may not be always or even frequently curable. The conditions of the glass-treatment are exceptionally difficult to carry out, and often can not be done at all, especially if conscience and sym-

pathy are absent. The improved general health, freedom from headaches, etc., would make it at least a saving of money for the state to pay an expert resident oculist. This, apart from the humane consideration. Nobody can rightly estimate the number of degenerates, paupers, defectives and dependents loaded on the producers and taxpayers because reading, writing, sewing, study, handicrafts, etc., are impossible to a person with disqualifying astigmatism. Neglect of the fact greatly increases the tax rate, and makes the philanthropic miserable.

Why does the truant school boy exist, and why does he so often develop into the young criminal? If the majority of these, as Dr. Case of the Elmira Reformatory finds, have an ocular defect that makes vision impossible for any continued reading, writing, or hand-work, does not the fact modify all penology? If the sewing-girl can not possibly sew, or do any such kind of eye-work, what alternative is often left her except crime? Sociology is very frequently another name for ophthalmology.

And if even to-day in the city the poor can not be fitted with a simple device to make their lives happy and independent, how is it with the other half or three-quarters of the people who live in small towns and in the country supplied only with the itinerant criminal spectacle-peddler? The farmers and their families now waste most of their evenings and their winters,

and then the sociologist blames them for their vile country newspaper and their unprogressiveness.

Philosophers and thoughtless critics bewail the literary pessimism of the age. It is indeed a pitiable and a pitiful fact. In a time when comfort and possibility of education and of enjoyment have suddenly increased a hundredfold, why the strange phenomenon of vastly increased skepticism, mental suffering, hopelessness and melancholy? Who have set the fashion? Certain powerful, but in some respects morbid, literary geniuses. Who were they? Those almost without exception who were great sufferers from physical disease. Of what disease? Simply of "migraine." Without a thought of the class to which they may belong, make a list of the literary pessimists of the last century, and another list of the optimists. The pessimistic or gloomy writers and artists were almost entirely great sufferers from eyestrain and from its result, migraine. They were, for instance, Nietzsche, the two Carlyles, de Maupassant, George Eliot, Wagner, Tchaikowsky, Chopin, Symonds, Tolstoi, Heine, Leopardi, Schopenhauer, Turner, Obermann, Thomson (the younger), Poe, and many others. Others that partially or wholly conquered the "migraine" of eyestrain by opium, or by renouncing ocular near-work, by walking, etc., are Mrs. Browning, DeQuincey, Coleridge, Beethoven, Parkman, Whittier, Margaret Fuller, Browning, Huxley, Spencer, Taine, Darwin, Lewes, Hugh Miller, Southey.

The optimists, the cheerful, hopeful, encouraging, loving and helpful ones, were, a few and at random, Goethe, Mozart, Verdi, Ruskin, Wordsworth, St. Beuve, George Sand, Emerson, Lowell, Longfellow, Hawthorne, Kant, Scott, Bronti, Dumas, Voltaire, Gibbon, Macauley, Mommsen, and a host of others.

In not one of the lives or writings of these last will you find a hint of eyestrain or migraine, hardly even of ill-health. Note also that the pessimists are mostly atheistic and materialistic, while hardly one of the healthy optimists is so. One may also remember the tendency to despair and even suicide in those who suffered the most from migraine. It is exactly so in private practice to-day. Pessimism and atheism are an expensive tax on the natural vitality, a danger to the public health, a brake on the wheels of the progress of civilization. If we care naught for the personal and preventible sufferings of these great workers in humanity's cause, nothing for those of the literary and other laborers tremendously increased by the very nature of their tasks, we at least should consider the welfare of the generations that follow us. As the creation and perfection of vision has been the condition of past biologic evolution, so its normalization and the avoidance of its pathogenic results is one of our highest professional duties and ideals.

THE LIFE TRAGEDY OF JOHN
ADDINGTON SYMONDS.

CHAPTER II.

THE LIFE TRAGEDY OF JOHN ADDINGTON SYMONDS.¹

THE reader of Brown's "Life of Symonds" must be strangely insensitive who is not sympathetically grieved by the peculiar and profound pathos of the man's life and suffering. One of the sharp appeals to the attention, coming almost as a shuddering jar, which so often halts one in reading Symonds' own words is shown in this challenge of his of "the injustice of the world":

"I felt at Venice, and I feel sure, very deeply, the injustice of the world, that a man like myself, who has no merits to distinguish him from the rest, should be, through luck of birth and money merely, enabled to play upon the lyre of life so largely to his satisfaction—sea, city, islands, pictures, palaces, there; here, mountains, fine air, forests, homely houses, flowers—and in both situations intellectual enjoyment, responsive human beings, energies of heart and hand."

There are few men so highly endowed with both the internal and external gifts of good fortune who have quarreled thus with Fate for its "injustice." There are fewer still who would have believed so naively in the momentary happiness which he caught

¹ Reprinted from *Maryland Medical Journal*, August, 1904.

out of the monotonous drag of wretchedness which made up his days and nights, his years and his life. The man who could think and feel as this one did may teach the reader the best lessons which come only from the intimate living with another through biographic study. One who loves the swift, clean sword of intellect, polished by knowledge and culture and handled by art and power, cannot pass by this duel between fate and personality. One who himself feels the tragedy that such swordsmanship may bring must have waited for this sad, bright hero. The physician who can see the pathogenic source of the sufferer's hurt should find a double pathos in the sad tale.

As in Beethoven's great symphony, the knocking of fate is at the very beginning. Not even in childhood was the boy allowed the usual boyhood plays and joys. From his earliest years and during youth he was tormented with frightful dreams, night terrors or nightmare, visions, etc., and from eight to twenty-eight he was struck as with a semiparalysis, and had daytime states of trance, self-absorption, times when space, time, sensation itself, seemed obliterated. He took no interest in athletic sports, and was wanting in muscular vigor. He preferred rambling alone and wandering over the downs or through the woods. He was afflicted with diarrhea, which at about twelve became severe and chronic. Somnambulism began at about this time to complicate the tormenting dreams.

From fourteen to eighteen he had a number of depressing ailments—colds lasting all winter, lack of energy, etc. His father, who was a successful physician, tried all sorts of drugs; but, as the autobiographer says, "these things did not touch the root of evil." All through Symonds' life he sets down the fact of the "root of evil," but, as usual, with the astonishingly repetited failure to recognize the cause and effect. So now he writes of "close study," the poring stupidly and mechanically over books, immediately preceding the sickness and the drugs. He is "tired and lamentably dismal about his study," forgets everything he reads, etc., and headache is "bitterly resented." He is "very ill, his memory weak, his head heavy, his limbs dragging, his whole being low," etc., until his father telegraphs him to give up all study, and then begins the walking, "much of it and every day."

But stopping reading was, of course, an impossibility with such a mind, although "to read as much as he intended he could and might not," and there continued the "bad, depressed headache, painful reveries, weary dreams, weakness, melancholy, nervousness at night, and inability to do literary work in the morning." He then "took to riding again, with much benefit to his health," for "rides take away the headaches and depression. I got sleepy and read less than I might." He was now twenty-one.

His return to Oxford was followed by a return of all the old symptoms—the persisting repetition of bad nights, sick-headaches, insomnia, weakness, nervousness, pain in the trapezoid muscles, depression, weakness of memory, etc. Study confuses him, and strychnin is resorted to. He is unable to read, and the steady complaints are reiterated of headache, cloud-over-brain, return of the “old cramped-head feeling,” amounting at last to “doubts, questionings, mad suicidal fancies,” etc. When coming up for examinations he has to use “sleeping draughts” and “pick-me-ups.”

Travel is, of course, commanded—(I am aware of the scurrilous clubman’s nonsense as to the reason given for his leaving Oxford; no word of correction is needed), and one should note the formidable list of books he took with him and devoured on trains, in hotels, etc., followed immediately by headache, sleeplessness, soreness of the scalp, neuralgic pains in the head, his eyes feeling “as if boiled, and regular centers of agony to move which is to set two instruments in motion.” These and many such ever-varying symptoms are entered many times a day in the case histories of their patients by the modern oculist. Here are others, set down by Symonds’ writing of three years:

“Strained feeling in the head.”

“Chills and rheumatism.”

“Pain, weakness, and aching eyes.”

“Brain so troubled; headache.”

"My eyes got worse at Oxford."

"Cannot read or look out of the window when on train, nor can I read or write during the evenings at hotels."

"Terrible physical and mental weakness. An oppression under which I hope you may never grow has weighted me to earth, and neuralgia has gnawed me until I am very feeble."

"Being unable to use my eyes for study, I read very little. But I was able to walk as much as I liked."

"Illness and *ennui*."

"Deeply wounded in heart, brain, and nerves."

"The physical illness, that obscure failure of nerve-force, which probably caused a subacute and chronic congestion of small blood-vessels in the brain, the eyes, the stomach perhaps, and other organs."

"Enforced leisure—periods of unemployed solitude more frequent and trying, owing to the weakness of my eyes and head."

"Hard to bear both blindness and weakness of brain in solitude, for thought and reading are rendered equally injurious to the chance of future strength."

"Head and eyes fail."

"Theater and lecture-rooms are bad for head and eyes."

"Sleepless nights."

"Weakness of head and eyes."

"Eyes for more than two years useless."

"Sinews, strong nerves, strong eyes, are needful for action. I have none of these."

"My brain refused to work; then my eyes were blinded."

"Wasted idleness of existence—that is what I suffer from."

"Not able to read much, owing to weakness of eyes and other ailments."

To lessen the ennui of the long periods in which he could not read and write, as also unconsciously to get physiologic relief from the reflex ocular irritation

aroused by reading, he now spent much of his days in rowing, riding, in social calls, entertainments, etc. He had now reached the age of 25, and the outcome of all the sufferings he had endured, the direct result, as it seems, was the development of "mischief at the apex of the left lung," diagnosed by his father. The significant fact needing emphasis is that "the appearance of this trouble began almost immediately, though very slightly at first, to relieve the brain trouble from which he had suffered so acutely." At once blisters, morphin, etc., produce a "head-weariness and eye-weakness" of which there had long been constant and bitter complaints. Now also begin "the long series of journeys in search of health," the cause of the ill-health always taken with the traveler as his most precious possession. Of course, there was the ever old, ever new "depression, thwarting of aspirations through ill-health," colds, and again bad colds, and still others, with records of "feebler, chronic trouble in the head," "permanent malaise and nervous sensibility, which made me incapable of steady work," etc. "If I produce, my thoughts tear me like vultures; I have to leave the lines unfinished."

This connection between writing and suffering, always recognized, becomes more vivid, but no suggestion of its true causal nature ever occurred either to Symonds or his physicians, except, of course, the

old fallacy that it was due to intellectual labor *per se*. Other jottings showing it are as follows:

"The daily *ennui* of my tired brain and eyes. Nervous irritation amounted at times to insanity. A sprained ankle made matters worse" [because it confined him to his room].

"Not able to use my eyes for continuous study."

"Why I have not written is simply . . . a letter costs me a good deal."

"Translation was intolerably irksome. It retarded the recovery of my eyesight."

"It was only by tours abroad that I kept myself from physical collapse." [Travel was the only way to keep him from study.]

"How my blood burned while I sat scribbling until the manuscript was finished!"

"The irritability of my brain rendered me peculiarly intolerant of sustained labor." [A natural, ancient, and ever-living example of *post hoc* logic.]

"I worked recklessly."

"In the winter my health, as usual, began to fail." ["As usual" also with all eye-workers.]

What an unintentional illumination the actual facts receive from such entries as these:

"I attribute my gradual recovery in no small measure to the fact that I resolutely refused to give up study."

"To write vigorously only ends in irritation of the nerves by night and day."

"Whatever you do, don't go and lose your health."

"Sudden and inexplicable collapses."

He read 16 books [in Italian] within a fortnight.

"When the eyes and brain are both disturbed there is no happiness."

"I have worked out the thread of *ennui* which made me take this paper to write."

All bad weather [keeping him indoors, etc.] are depressing to his health and spirits.

"Wandering again, partly for my eyes' sake."

He now dictated much of his work to his wife.

"Brain tired with correspondence."

The wet summer had a decidedly bad effect on his health and spirits.

"I was falling ill with too much writing."

"If I could have taken walks, I should have kept my health."

He worked 10 hours a day at proofreading, and was on the brink of actual collapse all winter.

He had continuous fever. There was only an hour or two in the morning when he could "use his head."

"The day's headache has begun, and I must stop."

"Tired and worn with writing."

The life of Michael Angelo caused "fainting and falling fits." "I have been very ill."

Another hundred quotations might be added to illustrate the thought now familiar to all ophthalmologists. These may serve as samples:

"I felt that my incessant brainwork and amusements at Davos are in a true sense occasioned by the total lack there of free sensuous beauty and delight inflowing from the outer world. Most of us who are not born mountaineers have been bred to the enjoyment of such things as the pyrus and cherry symbolize. Without, perhaps, being aware of it, they are driven too much in upon themselves by the monotony of snow through seven months of winter and the austerity of that brief summer of the mountains. The tension becomes at last too great. They react against it by debauches of brainwork, stimulation, company." (49.)

"Then came the goddess Drudgery I had invoked, and spoke to me, and I replied as follows: 'It is my particular source of misery that I cannot labor; I am forced to be inactive by my health. If I could study for six or seven hours a day, the intervals might be devoted to a well-earned relaxation. But now the whole day has to be devoted to encouraging a cheerfulness and peace that rarely comes. Relaxation is labor, and the untamable soul frets under its restrictions.' A little nervous strength might make all the difference—a loosening of the bands about my forehead, a soothing of the aching eyes. (28.)

"Ever since you left us in the summer I have been suffering from a chronic inflammation of the eyes. This made my literary work painful. And I was under obligation to do a heavy bit before the end of the year. I translated Cellini's 'Memoirs' into English. Under this pressure I broke down, and I have been seriously ill for more than two months with a very exhausting fever. It is of the nature of ague, I think, and has implicated the lungs. The result is that now I spend wretched days of helpless prostration without brain, suffering in every joint, alternately icy cold and burning hot, sleepless at night or pursued by tedious dreams, incapable of moving beyond my house and its wooden shed outside, the mere shadow and vision of a man."

Whether ill or not there was no respite of literary work:

"I have managed in this illness to write a long poem in ottava rima on an Italian story, another in terza rima of a ghastly kind, an elaborate essay on Heywood's plays, a notice of Brome's dramatic works, and a portion of an essay on the Italian republics of the Renaissance. But it is killing work. I say to myself, like Macbeth, 'At least we'll die with harness on our back.'" (33.)

And the curious and long well-recognized sudden

alternations of seeming health and profound suffering in migraine are often met, as, *e. g.*:

"What I suffer I only know. And when this emotion becomes blunt I shall know, not that I am freed, but that I am dying, for these intense pains are a condition of vitality in me. It is all this which makes me alternate between feverish and voracious work and exhausted idleness. I have intervals of clairvoyance and intervals of stagnant blindness." (33.)

"Violent revolutions of subjective tone from extreme quiescence to febrile excitement, and back again."

As from the beginning up to his death there break forth the constant and painful iteration of the affliction of colds and draughts—chest colds, heavy colds, severe colds "which left me exhausted," bad colds, bronchitis, long and tedious illness; "I catch cold then," severe colds, bronchitis, influenza, etc. The intimate and causal connection of eyestrain and colds, influenza, and diseases of the respiratory tract is growing clearer to the profession nowadays. Patients long ago found it out:

"The way in which my nerves as well as lungs have been attacked looks like influenza." [And he thinks it a result of his writing.]

Just before his death (at 51) his cold was worse, his "throat very bad—almost a form of diphtheria."

So far as concerns the biographic clinic upon Symonds' life the greatest medical interest may lie in the development of his pulmonary tuberculosis. The diagnosis of any lung disease was made when he was

twenty-five, following close upon the years of intense suffering, denutrition and weakness, all, as seems clear, the reflexes of eyestrain. Careful observations of the histories and morbid conditions of many such patients have convinced me that the severe migraine of eyestrain is a potent and frequent source of tuberculotic infection. It is of less concern whether one accepts as the method of pathogenesis—

1. The chronic denutrition and physical weakness which supplies a prepared soil for the infection;
2. The psychical depression, hopelessness, or melancholy, which reduces the energizing power of a healthy and active will; or,
3. The direct action of the morbid ocular reflex upon the pulmonary tissues.

In the case of Symonds all three causes were in synchronous and constant action. He himself recognized somewhat vaguely, but still definitely, the influence of a direct reflex when he says, fifteen years after mischief at the apex of the left lung has been diagnosed: "The subsequent lung disease from which I am now suffering is no doubt the result of the strain of those years." More clearly it came out in the statements:

"Curiously enough, the lung troubles, which now threatened my very existence, seemed to relieve the misery of my brain. Gradually that organ regained tone, although I suffered frequently from attacks which proved that the disorder had not been lived down. Sustained mental labor was out of the question. I worked by fits and snatches." (31.)

"I always find that to organize a big book drills the holes in my lung. The other part of the business bores the body out, but does not destroy tissue."

"The friction of setting down to work has stirred my lungs up, and I am again far from well."

Pulmonary disease began at 25. Blisters were applied to the chest at 28; his "chest was so weak" at 31; his first hemorrhage was at 37, when he was "face to face with death and weakness"; Quain and Jenner give a poor report of his health at 40; Clark and Williams detect beginning disease of the right lung at 42; Davos makes a nervous man of him, pulls him together, and "cures the old lung trouble" at 48; there are always bronchitis and colds; he has "three months of illness, continued fever, and general disturbance of the whole system, including brain, lungs, and stomach." The symptoms immediately preceding his death at 53 remind one of those of Lewes and George Eliot. As a case of tuberculosis the general practitioner must find the clinical history highly anomalous, and the existence of other pathogenic factors than the simple tuberculotic process is clear. The chief was undoubtedly eyestrain and its migrainous reflexes. These were clearly active every day of his life.

The character of the man and of his fundamental disease is further illustrated by the interest he took, the time and money given to the social, urban, and

economic welfare of his fellow-citizens at Davos, by the marvellous energy—physical and mental—shown in his walks, sports, mountain-climbing, tobogganing, etc., almost up to the day of his death. The account of a day's sport a year or more before his death given by his biographer (p. 459) and of his dancing the pizzica "as vigorously as any of the vigorous natives" less than a month before his death are facts that put a caution in the thought of the wary diagnostician. His biographer writes of him at the age of 44 :

"Symonds' great physical energy was certainly one of the most remarkable and surprising things about him. No one who shared one of those expeditions with him would ever have suspected the invalid in that lithe, elastic figure, which breasted the hills with such apparent ease and left many a sounder man behind him. It was his intense spiritual vitality, his nervous energy, his keen enjoyment of lovely sights which supplied the motive power. These walking expeditions, of which he took several in the autumn of the year 1884, would have proved no slight tax on the resources of most men. A few days before the ascent of this Schwartzhorn, which is 10,300 feet high, he had enjoyed what he calls 'three splendid days' on the hills."

It seems clear that the disease from which he suffered was a preceding, causing, and always complicating condition which, had it been recognized, as it should have been, even from his thirty-fifth year onward, would have given him sound lungs and a long life of usefulness and power.

A parenthetic word may not be amiss as to an

always recurrent phase of the clinical history of eye-strain sufferers—that is, the influence of the added strain of presbyopia. This, when unrelieved, brings the lifework to a crisis of impotence and breakdown, and end, even of the life itself, as in the cases of Nietzsche, George Eliot, Lewes, and others. With the entrance upon the presbyopic period new elements and added intensities of old ones are added. For instance, see the paragraph on a preceding page. At the beginning of this period (age 39) he writes:

“I have got up today for the first time since last Friday. I have had a strange attack, quite *unlike anything I experienced before*. From 2 P. M. on Friday to 4 P. M. on Tuesday I suffered from intermittent pain of a really horrible kind. I thought I must die or become insensible. And yet my mind was lucid.¹ It was a long hurricane of torture, with short respites got by triple doses of chloral, lasting an hour and a-half. I live in dread, for the whole theatre of my former misery throbs with a dull menace. It is not over, and I am so weak that I can hardly form these words. I never felt pain on so august, so colossal a scale. There was something grand in it. Most pain has an element of the nasty. This was like hell. It is worth the misery to have registered the sensation.”

“I have suffered for more than a year from unrest, mortal fatigue, and from strange morbid irritabilities. The will to maintain feeble health at its maximum is broken down.” (45.)

The most active of his literary years, age 46, was followed by great vital depression.

¹ Compare the noteworthy likeness as to this lucidity in the case of Nietzsche—a long recognized fact in migraine.

Tormented by his own suffering and the unfathomable mystery of it, he despaired almost of his own sanity, as so many other migrainous patients have done, and at the crisis of presbyopic wretchedness he writes :

"How can a writer escape from being neurotic? He has such tremendous changes of mental climate and revulsions of emotion. He is always vehemently growing or being violently amputated, and he is not a vine to suffer these alternatives in the due course of natural seasons. If genius is connected with insanity, this must be due in many cases not merely to a congenital diathesis, but also to *the abnormal vibrations set up in the nervous system of an author by the conditions of his labor*. A pendulum has rhythmic action so long as the motive force lasts, but here the creative rhythm is suddenly suspended just when the nervous energy is overstimulated to its utmost. I feel the fact acutely at the present moment, and am tingling, jumping."

And at 53 he died, a hero of erudition and literature, a martyr of medical indifference and ignorance. The principles had been scientifically stated for thirty years which, if put into practice, would have given him complete relief. Although many thousands have found that relief during the last twenty-five years, many other thousands are to-day needlessly suffering exactly as did Symonds.

At the age of twenty-five Symonds wrote in his diary :

"And for what work am I fitted? Jowett said, some time ago, for law or literature. I say, after some months' trial, not

for law. And for literature, with these eyes and brain? What can I do? What learn? How teach? How acquire materials? How think? How write calmly, equably, judicially, vigorously, eloquently for years, until a mighty work stands up to say: 'This man has lived. Take notice, men; this man had nerves unstrung, bleary eyes, a faltering gait, a stammering tongue, and yet he added day by day labor to labor and achieved his end!' Shall it, can it be?"

At 33 he describes himself as—

"Working very hard in my study at Clifton Hill House and filling four or five thick books of manuscripts with fervid declamations. But the strain was severe. I fear the whole horizon is changed for me as usual. Almost from the date I saw you in London I have been ill. I had to give up my visit to Eton, and on arriving here to take to bed. Bronchitis began the mischief, and the last three days have been one protracted torment. I sometimes wonder whether there are many men thwarted as much as I am by a series of protean small ailments; then I wonder with a sort of vanity how many of the kind do as much as I do."

At 51 his working day is thus described:

"I begin work at 9:30, and go on till 12:30; after lunch, at 2:30, I go to bed and sleep two hours; have tea in bed and talk to my wife; dine at 6:30; begin work again at 8 P. M., and go on with it till 1 or 2 A. M.; then to bed and sleep again."

The result was one natural to the depressing effect of severe migraine, but doubled in Symonds' case by the piteous crippling of his splendid scholarship and noble aims in life. Few men are born with wealth, intellect, the esthetic temperament, and a burning love

of truth, who desire only to work unselfishly for the best interests of civilization and their fellow-men. When one such appears it is a genuine tragedy both for the man himself and for the world if ill-health prevents the rare conspiracy of the benevolent fates. And the pity of it is all the greater if the tragedy was wholly unnecessary and obviabie. For the patient it is, as Symonds himself wrote, "the final sense of impotence to be effectual, most poignant, most crushing, most persuasive, and yet unutterable." The heart-rending outbreaks of sorrow and disappointment at his destiny (see pages 214, 230, 238, etc., of the biography) are almost too poignant to reproduce. More than once he thought of suicide, and once, at 28—note the age—he seriously contemplated it. He had thought deeply, perhaps too deeply, of his life-problem, but his nonmedical mind could reach no nearer the simple, little-great truth than "it is the center of the soul that ails." Intellect, one must keep repeating, is the product of vision—physical, or rather physiologic vision.

Even before this, a youth of 25, he approached the problem in this way:

"What happens to me is that one tide of physical depression after another sweeps over me, and not one leaves me as I was before. Each weakens me. I feel my strength of mind, and power of action and fancy, and sense of beauty, and capacity of loving and delight in life gradually sucked out of me. At the present moment I do not know what to do. Life is long

for unnerved limbs and brains which started with fresh powers, now withered and regretful only of the past, without a hope for the future. I do not write this because I am not happy in my home. Far from that. But happiness, domestic felicity and friends, good as they are cannot make up for a *vie manqué*. If a man has in his youth dreamed of being able to do something, or has rashly promised himself . . . if setting forth thus, he has failed upon the threshold, . . . then he resembles those for whom the poet wrote '*Virtutem videant intabescantque relicta.*' But I am not in despair. No one should give over hope. I am only disappointed at the failure of anticipation, and sorrowfully convinced that the weakness of which I have been conscious is inherent and invincible."

There is no doubt whatever as to the correctness of his diagnosis. There failed only one little logical nexus and conclusion:

"I sometimes imagine that if I had force enough to work over and over again at expression I might produce some satisfactory results. But I dare not apply such '*improbis labor.*' My brain will not stand it. I lose my sleep. I am perplexed with obscure pressure on the top and front of the head. And this *Umarbeitung* cannot well be deferred until I have regained force. It is most effectual when the iron is yet hot and the enthusiasm of the first conception remains plastic. Thus I am thrust by my physical debility into the petty style. Yet even as it is, in this imperfect work, I derive the greatest pleasure from the contemplation of the great thoughts and splendid images presented to me, which I do not try to put into my own language, and for the moment feel assimilated to them." (27.)

And despite this glimpse of vague therapeutics:

"What I managed to do was done under great difficulties and in a desultory, fragmentary manner. Moving from one

place to another, without access to libraries, and always in depressed health, I could not undertake any important work or engage in any regular scheme of study. Intellectually, I lived from hand to mouth. The weakness of my eyes rendered systematic reading impossible, and I depended, in a great measure, upon my wife's unfailing kindness. She read aloud to me for hours together."

"No one who has not suffered in the same way can adequately feel how great is the sapping, corroding power of my debility—eyes for more than two years useless; brain for more than two years nearly paralyzed—never acutely tortured, but failing under the least strain and vibrating to the least excitement. To feel as little as possible, to think and work as slightly as I could, to avoid strong enjoyments when they rarely offered themselves, has been my aim. I have done nothing in this period by a steady effort. Everything has come by fits and starts of energy, febrile at the moment, and prostrating me for days when they are over. Sometimes for weeks together I have not seen a ray of sunlight. At Florence, at Rome, in London, at Clifton I have risen with horror of these nights, have walked through the day beneath the burden of dull-aching nerves, and have gone to bed in hopelessness, dry with despair, and longing for death. Suddenly, in the midst of this despair, a ray of my old capacity for happiness has burst upon me. For a few hours my heart has beat, my senses have received impressions, my brain has coined from them vigorous ideas. But vengeance follows after this rejoicing. Crack go nerves and brain, and thought and sense and fancy die. The leaden atmosphere of despair closes around me, and I see no hope. Many are the men, no doubt, who have suffered as I have suffered. Last summer I spent six days in London, in Half-Moon Street. I had just been subjected to treatment which gave me great pain and made me very weak. If it succeeded, it was to do wonders. In the midst of my weakness I hoped. I sat upon one chair, with my legs upon another. I could not read. I could not bear the light upon my eyes, I was too

desolate and broken to see friends. I scarcely slept, and heard all night London roar, with the canopy of flame in the hot sky above those reeking thoroughfares. At three or four day broke. In the evening I sat idle, and it was dark. All the while I hoped. This cure shall do wonders. God, give me strength. . . . Cast me not utterly away as a weed. Have I not longed and yearned and striven in my soul to see Thee, and to have power over what is beautiful? Why do I say 'Lord, Lord,' and do not? Here is my essential weakness. I wish and cannot will. I feel intensely, I perceive quickly, sympathize with all I see or hear or read. To emulate things nobler than myself is my desire. But I cannot get beyond—create, originate, win heaven by prayers and faith, have trust in God, and concentrate myself upon an end of action. Skepticism is my spirit. In my sorest needs I have had no actual faith, and have said to destruction, 'Thou are my sister.' To the skirts of human love I have clung, and I cling blindly. But all else is chaos—a mountain chasm filled with tumbling mists; and whether there be Alps, with flowers and streams below and snows above, with stars or sunlight in the sky, I do not see. The mists sway hither and thither, showing me now a crag and now a pine—nothing else. Others see, and rest, and do. But I am broken, bootless, out of tune."

TAINE'S ILL HEALTH.

CHAPTER III.

TAINÉ'S ILL-HEALTH.¹

HIS teacher, Vacherot, said of Taine at the age of 22, that he was the hardest worker and the most remarkable student he had ever known at the École Normale; that he was prodigiously learned for his age; that he had an ardor and an avidity for knowledge such as his teacher had never before known. Those who have read Taine's works must have been struck by his marvelous power of absorbing and digesting knowledge, and his ability—he was philosopher, historian and critic, all in one—to present the systematized results of his erudition with a thoroughness, sympathy, succinctness and brilliancy rarely, if ever, equaled. Few, however, are aware of the difficulties this great litterateur encountered in carrying out his scholarly ideals, his poverty, the opposition of the church and of those envious of his remarkable talents and industry, and particularly the ill-health, which like a vindictive fate pursued him so relentlessly. Even those who may have learned something of these things have probably not an adequate conception of

¹ Reprinted from *American Medicine*, Vol. VIII., No. 19, pages 805-808, November 5, 1904.

the exact nature and origin of the man's sufferings and of how they prevented the realization of his aims in literature, which, without the crippled executive ability, would have resulted in wonders.

Taine was born in 1828, and at the age of 11 "he had devoured everything in the way of books that came into his hands, especially the classic authors of the seventeenth and eighteenth centuries." This precocious ripening of his mind and enormous amount of reading seems not to have produced serious evil results to his health during adolescence. He was "somewhat fragile" at 12, and needed to pick up health and strength at 20. At 21 his troubles began. The following excerpts from his letters and from his biographer's notes are sufficiently self-explanatory and illuminative of the nature of his disorder, so that they may be given without the interruptions of annotations:

"It often happens to me to fall into a state of languid depression, during which I spend hours on my bed or in an arm-chair, in that sort of mental prostration so dreary and oppressive, which you know." (21.)

"I have a bad headache at this moment, and am incapable of serious thought—I am even going to take a few days' rest." (21.)

"Cholera, or a sort of mild imitation of it, seized hold of me, and laid me low those few days." (21.)

"When my head aches with work (study)." (23.)

"If my head aches." (23.)

"Hegel makes my head ache." (23.)

"Studies so fatiguing that I feel I never really appreciated rest before." (23.)

"I am in the dumps. It happens to me when my head aches, and I have no resource but to laugh at myself and others." (23.)

"Sometimes I have headaches, moments of weakness, when my solitude palls upon me." (23.)

"Struggling in the most marshy depths of the bog of melancholy." (24.)

"This last resource—writing—is failing. I am not well, and in such depressed spirits that I find it impossible to string two ideas together. My last refuge against myself has failed." (24.)

"There are days when I am so sick of myself that I should like to throw myself away." (24.)

"My aching brain prevents me from finding a relief in work." (24.)

"The country is an opiate for troubled brains." (24.)

"When my head aches." (25.)

"This horrible scribbling dazzles me, and my head seems full of pages, letters, lines, corrections, etc." (25.)

"Bored when my head aches." (25.)

The immoderate labor of those years began to exhaust his powers. In October he was seized with a granular laryngitis, from which he suffered for several years. (Biography, 25.)

The bad state of his health lasted during the winter. His physician advised spending his vacation at St. Sauveur. (Biography, 26.)

He was obliged to limit his work hours and lectures. (Biography, 27.)

"For a month I have not spoken six sentences aloud." (25.)

"The cure of the throat is slow." (26.)

"Impossible to study with the least appreciation; immediate head symptoms. My winter is being lost. May the beautiful, lovely spring be medicine for me." (26.)

"I am doing everything to be cured, without much success." (26.)

"My throat does not better. I shall probably be compelled to go to some watering place and pass the winter in the South." (26.)

"The worst is that my head is so bad that I am unable to apply myself for an hour, beside having an increase of feverishness."—

"If I had not this fever and a head so ailing." (26.)

"My throat is better, the homeopath prescribing phosphorus, which perhaps will cure me." (26.)

"I am an old man, used up, tired of everything, hopeless." (26.)

"Sick to-day." (26.)

"When I do not have headache I write." (26.)

"To what watering place I do not know, the physician will decide." (26.)

"I have left the homeopath, who was tiresome. The good I thought he was doing to me was really the summer season and the company of my mother. Many physicians are sceptics in medicine. Some believe only in quinin and surgery." (26.)

"Worse for several days. I leave in July." (26.)

"The necessity of doing nothing, six weeks of it under a burning sun, without distraction, except to drink rotten-egg water, etc." (26.)

"A poor machine out of repair." (26.)

"The waters of Eaux-Bonnes are as valueless as those of Saint-Sauveur." (26.)

"Not cured, not curable." (26.)

"Since I have been ill I think everybody is ill, or should be." (26.)

"If I may believe the medical men, a race little to be trusted, I shall be better in a month, the waters acting only at a distance." (26.)

"When I do not have headache." (26.)

"... more frequently it creates headache; I stick in my room, badly cured, working seldom." (26.)

"I continue extracting descriptions from my sick head." (26.)

"I am no better. Take care of your health; if it goes you can't tell when it will come back again." (26.)

"Three months in the Pyrenees in complete idleness, trying to cure my sick head and throat." (29.)

"Try never to be sick." (26.)

He returned from his trip to the Springs suffering severely. Lecturing tired his voice. (Biography, 27.)

"I was sick and could not visit you. Neuralgias, congestions, huge nails in the nerves of my neck—for a month utterly crippled." (27.)

"I am studying the influence of the body upon the mind, and I ask myself what is the use of sensory nerves scattered so abundantly in our physical machine, unless to make us suffer uselessly, for the glory of God." (27.)

"The Eaux-Bonnes waters left me *statu quo*. I failed in faith, in that as in other things, and am punished." (27.)

"I have swallowed a cargo of books." (27.)

"What woes of the eyes and of the head? How many hours of mechanical reading? I am only a machine disgusted with itself." (27.)

If Eaux-Bonnes cured his laryngitis (*sic*) he had to pay dearly the ransom for his excess of work. . . . He was halted by a crisis of cerebral fatigue and nervous depression lasting for two years. He had to suspend entirely his work in philosophy, and was able to resume it only ten years later. He had also to renounce literary work in part; he wrote less and less frequently, condemned to long months of complete inaction during which he was unable to read much. (Biography, 27.)

For long hours, lying in his room, the eyes closed to avoid the light of day, which wounded his suffering head, he was read to by a little secretary helper. (Biography, 27.)

At times, in order to get sleep which had disappeared, he undertook fatiguing exercise, splitting wood, etc. (Biography, 27.)

After a year of this rusting he was able for a few months

to work (study) for two or three hours a day. (Biography, 27.)

Finding himself again suffering, he undertook voyages for the sake of diversion and to revive his intellect. But the threatening crisis was not conjured away by these journeys. He became more ill than before, and 1859 was the year the most saddening and sterile of his life. He believed seriously that his intellectual powers were entirely broken. He tried to take up his work, but the pen or the book soon slipped from his hands, and he fell back into his old cruel inactivity. Only at the end of the year with infinite devices did he begin to write. He has had since then frequent periods of forced leisure, but never one so persistent and intense. (Biographer, 31.)

"Sick for four months, unable to write and even to read, having a cap of lead on my head and frequent neuralgias. Nothing did any good, neither hydrotherapy, iron pills, or dieting. My physicians tell me to have patience and to keep still. I have renounced all work." (28.)

"Pardon me that I write so little; I am no longer a man, only an inferior sort of mollusc, and I feel my head no more except to suffer with it." (28.)

"A sick man who plants cabbages and walks five miles a day." (28.)

"Against orders I have lately made use of my poor head." (28.)

"Far from cured. I work two or three hours a day, in the morning, with the greatest precautions; the rest of the time I rub myself with cold water, sleep, digest, etc.—I go to bed at 9. This is why I do not write." (30.)

"One has to adapt one's self to his readers, if he would have his book sell at the newsstands." (30.)

"I accustom myself to live even though suffering. I am becoming patient. I bend my back. I am 30. I am going into the country to better my health." (30.)

"My voyage is delightful. Flanders has beautiful landscapes, and it encourages ideas." (30.)

"Especially I, who have bad eyes, and have abused them."
(30.)

"I am suffering very much, always from my head. I read or write scarcely two hours in the morning, and the rest of the day I am idle and kill time sadly." (30.)

"Not cured, although it was the chief object. I am forced to pass my life in walking the streets—what can one learn when he has to go to bed at 9 o'clock?" (30.)

"I am entirely down, commanded neither to write nor read."
(31.)

"A little better, not much. I read one hour a day." (31.)

"I wander sadly through the woods. I am a steam engine without fire, rusting, and rotting." (31.)

He did not dare to undertake his great work in his state of weariness. (Biography, 32.)

He had entirely given up private teaching, but he knew how study, pushed to an extreme, exhausted his forces. (Biography, 32.)

Appointed examiner. It had the advantage of demanding only three months work a year, and compelled him to stop his studies during the summer, which had been an affliction to him. (Biography, 32.)

"I have headache. It is my vicious habit." (33.)

"My excuse for not writing for three months is my headache; it is only half well now; I have done nothing for several weeks and even now I work at the most only three hours a day, so that I am cross when it comes to writing even to my excellent friend." (33.)

"Head as usual. I have reading done aloud to me; go to bed at 9, walk the quays." (33.)

"Keep your health, it is the substratum of the essence of substance." (33.)

"The literary life here, the necessity of earning one's bread by black lines drawn out of the head is too hard." (34.)

"Shall I be able to work? For a month I have not written a line; I had too great headache. I should have had to erase it all. I do not know when I can recommence my book, and

the undesired inaction and empty revery ends in eating away my life." (34.)

"I tried to occupy my forced leisure. I made notes in London, went up the Thames, to the Derby, to balls, to the slums, to the docks, to country houses. I copied, at the British Museum, an English Medieval author, etc." (34.)

"On my return to England I had to blot out a month, and that made two which were lost." (34.)

"I have exhausted my brain; I am obliged to stop and remain idle several times a year, sometimes for three or four months; I have remained for two whole years incapable of writing, and even of reading. Writing requires a tremendous effort on my part, and after two or three hours, sometimes one hour only, I am obliged to leave off, having become quite unable to string two ideas together. My manner of writing must be contrary to nature, since it is so laborious. Several people, friends, have told me that it is strained, wearisome, and difficult to read." (34.)

"I have much more difficulty in writing, to order facts or ideas, than formerly. A school-boy's task is an enormous weight which I lift only with effort." (34.)

". . . constant efforts and very little result. If I succeed in reaching the necessary state of mind, it only lasts an hour or half an hour, and it kills me. It is probable that I have tried to unite two irreconcilable faculties; one must choose and be either an artist or an orator."

"I think I have found the root of my complaint, for my fundamental idea has been that the particular passion or emotion of the man who is described should be reproduced, and all the degrees of logical generation stated. In fact, that a character should be painted after the manner of artists and constructed at the same time after the manner of reasoners. It is a true idea productive of powerful results when it can be applied, but it is unhinging to the brain and we have no right to destroy ourselves." (34.)

"If all this is correct, I must change my style, which is a

serious undertaking. A rest, and an extensive one, is first necessary, then a search among my remaining faculties, such as I may put to use. I shall finish my 'History of English Literature' in accordance with the former method. . . . But after this work is finished I must change. But what is left of me? What ability?" (34.)

During his long periods of forced idleness and suffering he had dreamed, etc. (Biography, 34.)

He set out for Naples and a softer climate. (Biography, 36.)

"There is so much emptiness, physical lassitude, and spleen, etc." (36.)

"I shall return next month and study—study is the proper word; I have already bought some books, but I have too bad eyes, and also a hurrying imagination, which spoils everything in advance. I admit that I have found things in the engravings more beautiful than the reality itself." (36.)

"It was well to go. I had to shake myself up, I was becoming sick." (34.)

"My pleasure was not great as I was too used up. Yesterday curled up in bed or in my chair, and all this morning." (34.)

"It was even an effort to write a letter. My eyes are painful, attention is immediately exhausted, anxiety supervenes, and with that, spleen." (34.)

"I am 36 years old. My life which is in the past is the healthy and strong part. The second part now commencing will soon be a descent; but through work I may make something of it." (36.)

"Sightseeing for four or five hours (at Padua) produces not only pain in the neck, back, etc., but attention is also exhausted; I am incapable of a single idea, and I have to close my eyes while I sit." (36.)

"Your poor Marcelain (himself) is exhausted; he works to excess, has a suffering head, is too sleepless. I am much troubled that he is using up his forces. His mother (he is writing to her) is much tormented. His affairs otherwise go

well—subscribers, announcements, esteem, success, are here. Let us hope that, like Woepke, he will not fall on arriving. The day is filled with public duties, and it is only toward midnight, on the return home, that he becomes an artist. He can then not resist the need of noting down his ideas and systematizing them. And the waking causes so much suffering!" (36.)

If the intelligent reader has looked over the foregoing excerpts attentively, the cause of this life tragedy and the harm done to literature will be plain. Especially if the similar histories gathered in the two volumes "Biographic Clinics" are known. The case-histories of all patients with the same morbidity-producing cause at work seem to a careless eye to differ from each other in marked degrees. To the physician's discrimination, however, the differences are either in the external circumstances of the patient, or in his peculiar or individual differences of inheritance, resisting powers, tasks, etc. In the case of the reflexes of eyestrain the clinical histories are likely to vary astonishingly according to the organs that bear the brunt of the derouted nerve discharges. This is a fact now familiar to modern oculists. But even in the most aberrant types there are certain facts and phases common to all: The suffering, of whatever kind, is directly consequent upon the use of the eyes; it increases in intensity with the lessening of the accommodative power; the sole method of stopping the suffering is by nonuse of the eyes; the depressing effect

upon the mind and feelings is always present; the disease being functional, and not organic, the essential health and vitality are not at first, nor for a long time, and usually never, irremediably affected. After the crisis the mental and physical energies suddenly return with astonishing promptness and energy.¹

In the fifteen biographic clinical cases I have studied, these and a number of other characteristics, such as insomnia, depression, limited power of working, etc., usually present, have been found, and the notes from Taine show them also present in his life.

When an otherwise healthy young person has headache upon near use of the eyes the capable physician nowadays knows what is the cause of it. When melancholy, physical and mental weariness, inability to use the eyes, insomnia, etc., become marked, when an excessive amount of reading and writing makes old symptoms more intense and produces others, there is no doubt as to what a scientific correction of the existing ametropia will do. No patient of the sixteen studied saw this simple relation of effect and cause, nor did any of their physicians. Each and all traced it to the peculiar character of the intellectual work done, or to the excessive amount of it. The popular newspaper nonsense about "brain fag" shows the

¹ His letters often speak of being in "good health" during the very weeks when he was temporarily suffering from migraine—a well-known clinical fact.

old error much alive among us now, although the simplest observation would make it manifest that where there is one who has "brain exhaustion" from overwork, there are a hundred who have no such symptoms from an equal or a greater amount of intellectual labor. This brilliant genius was a cynic in philosophy, but in real life pitiful and charitable, a determinist in scientific ethics, but at the end he confessed, as applied to the French Revolution, that such a creed could not explain. How much his unnecessary suffering molded his character would be impossible to decide, but it is certain that it hardened it to an appreciable degree.

Taine was forced to go through the hydropathy and water cures, the dieting, etc., just as all the other migraine sufferers of the last century did—those who were financially able to do so. The vast majority had not the money for such vagaries. Taine was one; he was so poor that he had to undertake guidebook compilation and all sorts of pedagogic and literary potboiling tasks in order to carry out the cult of these superstitions. Travel, open-air walking, "change of scene," etc., gave the others some relief, at least temporarily, except those who, like Taine, were doomed by an insatiable hunger and a driving necessity to carry books with them or find great numbers of them wherever they went. When the eyes were really rested there was the inevitable relief.

Taine's "granular laryngitis," "cured by the waters at a distance," shows the possible reflex of eyestrain to the upper air passages, a fact noted by observant oculists. When it was cured his head symptoms grew worse.

The dip into homeopathy is not so amusing as that of the Carlyles, but shows the clear-headedness of Taine, who had a not inconsiderable medical education.

My notes stop at the age of 36 with the two columns of the *Life and Correspondence* that have been issued. He lived for twenty-eight years after this till 1893, and died at 64. It is comparatively useless to continue the study for the rest of the life, even if the remaining volumes had been published. Either the patient got some glasses several years before he died, which in some measure lessened his evident eyestrain, or his sufferings continued, probably increased, until the end of the presbyopic period, or until his myopia lessened the usual reflexes of this time of life. That he was myopic even in middle manhood is plain from some of the sentences quoted. It is the old story repeated—the production or increase of myopia by uncorrected ametropia. That he was also astigmatic and anisometropic is beyond question from the fact of his most severe reflexes caused by the use of his eyes, both to the eyes themselves and to the brain. Only Professor Möbius of Germany still believes that there is no eyestrain, nor any migraine due to it, in myopia—by



PHOTOGRAPH OF TAINE SHOWING STRABISMUS AND PTOSIS.

which term he means what is unknown to him, compound myopic astigmatism. All of these inferences would be sufficiently clear without the demonstration given by a late photograph of M. Taine, which I reproduce. This picture shows that toward the end of life there was paretic, almost paralytic, ptosis or drooping of the lids, a somewhat frequent result of long-continued eyestrain. In the right it is greater than in the left, showing the longer and more severe, but at last ineffectual, effort to keep the right eye in function. The entire expression of the eyes and neighboring structures speaks plainly of the struggle. "His eyes showed a cast behind their spectacles," says one who knew him in later life. The date at which the right eye gave up the attempt at binocular vision is not suggested in the life and letters. In the picture it is plainly strabismic, or turned in. Its exclusion from use marked the end of long and painful period of effort, which, while it lasted, produced great suffering, and when completed would probably bring a decided, possibly an entire, measure of relief. How easy it is at present to prevent in modern patients the entire list of evils which is evident in the case of Taine! And yet there are still many thousands in the civilized world enduring them as he did only thirty or forty years ago.

EYESTRAIN AS A CAUSE OF
HEADACHE AND OTHER
NEUROSES.

CHAPTER IV.
EYESTRAIN AS A CAUSE OF HEADACHE AND
OTHER NEUROSES.¹

BY SIMEON SNELL, F.R.C.S.ED.,

*Ophthalmic Surgeon to the Royal Infirmary, Sheffield,
England; Professor of Ophthalmology,
University College, Sheffield.*

OF all painful affections probably headache causes the most distress and misery. The individual who never experiences headache is much to be envied, and many persons fortunately enjoy more or less complete immunity from the affection in its more severe forms. On the other hand, there are many who are afflicted with headache which causes constant or recurring suffering, and which frequently so disables its victims that life becomes a burden. In many cases the occupation of the sufferer is seriously interfered with. A consideration of some of the causes of this suffering

¹ In his preface, Mr. Snell says: "The address here printed in book form was delivered in the first instance before the York Medical Society and was published in the *Lancet*. It is now reprinted with a few alterations, and the addition of illustrations." By Mr. Snell's kind permission it is included in the present volume.

and the measures which may be adopted for its relief is well worthy of our attention.

Historical.—It has, of course, for some time been known that certain instances of headache bear some relation to eye defects. But the far-reaching effects of eyestrain and the relief afforded by the proper correction of refraction errors are not by any means as widely recognized as they demand. It is a matter that, in my opinion, admits of no question. The evidence is continually before one. Again and again is the same story told, first of the suffering and then of the relief afforded by optical aid. In my last eight hundred refraction cases in private practice I find that one hundred and sixty-two suffered from headaches. I do not include in this number those making the usual complaint of discomfort for which hypermetropes and early presbyopes so frequently solicit assistance. In the cases to which I refer the patients have at once volunteered that they suffered from severe headaches, or have stated on inquiry that they do so. In the great majority this constituted the cause for seeking advice. In most, also, in varying degrees, were associated some or all of the train of symptoms to be described later.

Perhaps no more important work has been accomplished in the whole range of medicine and surgery than that of placing anomalies of refraction on a firm scientific basis. This we owe in the greatest measure

to Donders, and it brought to him undying fame. It is well-known, too, that astigmatism, which has such a close bearing on our subject, was discovered by Thomas Young, the physician as well as the physicist. Sir George Airy, the astronomer royal, described astigmatism in his own case. It was of the compound myopic variety and was monocular. Here it is of interest to note that Airy was the subject of migraine, and he described his own case in a paper in the *Philosophical Magazine* for 1865.¹ It may be remarked in passing that a proper correction of his refraction error, with the knowledge which we now possess, would in all probability have relieved him of his migraine, for he had both astigmatism and asymmetry in the refraction of the eyes, two very potent causes of headache, as will be shown farther on. Airy's son, Dr. Hubert Airy, also published a very graphic description of migraine and the ocular symptoms in his own person,² and it appears not unlikely from the account which he gives that he, too, would have been relieved, as has so often been the case in my experience in similar instances, if attention had been given to his eyes. He speaks of his attacks coming on after close eye-work, and says, "Usually after two or three hours' close reading, especially if I had insufficient

¹ *Philosophical Magazine*, July, 1865, Vol. XXX., p. 19.

² *Transactions of the Royal Society*, 1870.

exercise, I become aware that part of the letter I am looking at, or a word at some little distance from the sight point, is eclipsed by a dim cloud spot," . . . "Want of exercise, sedentary employment, close reading and writing, are the usual antecedents. It generally comes on while the eyes are engaged with toilsome reading."

The interest that Young and Airy had in astigmatism was physiological and not pathological. And even Donders lays stress always on the normal and abnormal astigmatism, the latter being astigmatism which interfered with the acuteness of vision. Our interest here, however, is in the pathological significance of astigmatism and the subtle and powerful influences of eyestrain, and not necessarily on its interference with visual acuteness. Frequently no complaint of vision is made and the error of refraction is only discovered after a careful and complete examination of the eyes.

As far as I am aware the first to recognize clearly the close connection existing between headaches and other neuroses with eyestrain was the distinguished physician and writer, Weir-Mitchell, of Philadelphia. In a series of articles he urged the importance of a proper understanding of this relation. The views which he set forth are so well expressed and have such a practical bearing that they may still be read with

profit¹ by those interested in the subject. He recognized that the distant symptoms may be the indication of eyestrain when no complaint is made of any defect of sight, and this is a point of the greatest practical moment. He cites several cases from his experience and says of them "that the cases just told seem to me enough to prove that the eyes may long rest unsuspected as the cause." I make here the following quotations:

"My conclusions have plainly enough taught me that hardly any men in the general profession are fully alive to the need of interrogating the eye for answers to some of the hard questions which are put to us by certain head symptoms, since many of the patients treated successfully by the correction of optical defects never so much as suspected that their eyes were imperfect. What I desire, therefore, to make clear to the profession at large is: (1) That there are many headaches which are due indirectly to disorders of the refractive or accommodative apparatus of the eye;

¹ The references and titles of the articles are: (a) *Medical and Surgical Reporter*, July 25 and August 1, 1874: "Headaches from Heat-Strokes, from Fevers, after Meningitis, from Over-use of the Brain, from Eyestrain." (b) *Ibid.*, February 6, 1875: "Notes on Headaches." (c) *American Journal of the Medical Sciences*, April, 1876, pp. 363-73: "Headaches from Eyestrain." For these references I am indebted to Dr. George M. Gould's able and instructive volume entitled "Biographic Clinics." He there gives copious extracts from Weir-Mitchell's articles.

(2) that in these instances the brain symptom is often the most prominent and sometimes the sole prominent symptom of the eye troubles, so that, while there may be no pain or sense of fatigue in the eye, the strain with which it is used may be interpreted solely by occipital or frontal headache; (3) that the long continuance of eye troubles may be the unsuspected source of insomnia, vertigo, nausea and general failure of health; (4) that in many cases the eye trouble becomes suddenly mischievous owing to some failure of the general health or to increased sensitiveness of brain from moral or mental causes."

Lauder Brunton some years ago¹ also very forcibly pointed out that the cause in many cases of headache must be sought in some irritation of the sensory nerves. It was to be found in the teeth, eye, throat and nose. He makes references to the teeth as starting irritation of sensory nerves and does so with excellent illustrations. He then says:

"Perhaps a more frequent source of headache than even decayed teeth are abnormal conditions of the eyes. The headache which comes on after working with the microscope or after straining the eyes in a picture gallery is only too well known. It is usually frontal, often extending over the whole breadth of the forehead, but sometimes limited to the forehead

¹ *St. Bartholomew's Hospital Reports*, Vol. XIX., 1883, p. 336, etc.

above one orbit. It would be going too far to say that frontal headache is always due to an abnormal condition of the eyes, but I believe it is so much more frequently than one would at all suspect. . . . But frontal headache is not the only one which may arise from abnormal conditions of the eyes, for megrim, or sick headache, is very frequently associated with, and probably dependent on, inequality of the eyes, either in the way of astigmatism, myopia or hypermetropia."

Since this time others in this country have written on the subject, notably the late Mr. H. B. Hewetson, of Leeds. But in America it has received much more careful notice than in this country. Recently Dr. George M. Gould, of Philadelphia, in able articles in *The Lancet*¹ and the *British Medical Journal*,² has called attention to the effects resulting from eyestrain and the treatment which they demand.

Migraine.—Before going on to the consideration of the class of cases with which this paper is chiefly concerned, a few words may be said about migraine, for many instances of this disorder in which the classical symptoms are present will be relieved by giving attention to ocular errors. Two medical friends who have

¹ *The Lancet*, August 1, 1903, p. 306: "The Ill-health of Richard Wagner."

² *British Medical Journal*, Vol. II., 1903, pp. 663 and 757: "The Role of Eyestrain in Civilization."

been closely associated with me have experienced an almost entire absence of the disorder since their astigmatism was corrected. One of these had several attacks of typical migraine. The last attack, which brought him to me for examination, he thus describes:

“ I went to the ward to do a sugar determination. I then found I could see only the right half of the meniscus at the top of the fluid. In ten minutes (I noted the time) a black star appeared in the center of the field. It lasted about thirty seconds and then enlarged; the vision in the center of the field cleared, and towards the left side of the field there appeared the fortification spectrum. It lasted like this for twenty minutes, flickering all the time and moving away from the center. For an hour after this there was some headache on the right side. This was intensified by lowering the head to use the stethoscope, coughing and contracting the scalp muscles. There was no tenderness of scalp. For several hours afterwards there was dull pain in the right occipital region on coughing or lowering the head.”

In May, 1902, he came to me and I found myopic astigmatism (— 1 D. with — 0.25 D. cyl.) in the left, and myopia (— 1.5 D.) in the right eye. He wore the correcting glasses constantly and had no further attack of migraine until a year later. Then an attack followed his leaving off the glasses for reading in the

evening. He again took to the use of the glasses constantly and no further attack has occurred.

The other case was the following. A youth, aged 14, began to have typical attacks of migraine which were always precipitated by reading. At the age of 22 he was ordered convex spherical lenses which gave practically no relief. At the age of 25 I carefully estimated his refraction under a mydriatic. In the right with +1.5 D. sph. and +0.5 D. cyl. vert. V. = $\frac{5}{8}$: in the left with +1.25 D. sph. and +0.5 D. cyl. vert. V. = $\frac{5}{8}$. Cylindrical in combination with spherical lenses were prescribed and gave the greatest relief. He still continues to have migraine, but the attacks are transient and at much longer intervals. He can now read and write for hours at a time without fear of precipitating an attack. The correction of the astigmatism has been most marked in relieving the nausea and dyspepsia.

Headache—its Situation, Characteristics, etc.—The headaches, however, which we have now to consider belong to a different category. It will be well, therefore, to specify in some detail the situation and character of the headache met with, together with other associated symptoms. The pain may be frontal, across the forehead, or just above the eyes, limited to the supraorbital region or reaching to the hair. This frontal situation is perhaps the most common. It may also be in the temples. It may be between the

eyes and at the root of the nose (fronto-nasal). The pain is frequently paroxysmal and called neuralgic, or it may be a more dull continuous pain. Usually it is bilateral, but it may affect chiefly one side, one eye, one temple, or one side of the forehead. When this is the case it is often described as neuralgia, especially when affecting the eye. Unilateral headache is often associated with astigmatism on that particular side, whilst the other eye may be normal in refraction or have ametropia of less consequence. Pain may be at the vertex, and this is a frequent seat. It may be a dull continuous pain or it may be of a dragging character. One lady described it as if an "iron claw was gripping her head." The occiput is another situation where pain is localized. It may extend down the nape of the neck to the spine. A lady referred to the pain as if a large crab had seized her by the nape of the neck, whilst another said the feeling was as if thousands of strings were in the back of the neck and as if someone was pulling them. In some the pain is confined to the neighborhood of the eyes, forehead or temple, whilst in others it may be associated also with vertical or occipital pain. It may, moreover, be continuous, lasting for long periods, or it may be intermittent. Some speak of never passing a day without suffering, whilst others may have a headache daily or be free for portions of the day; others suffer once or twice a week, and others again only at longer inter-

vals. The pain is sometimes relieved by pressure over the most painful part.

Giddiness, Sleeplessness.—Giddiness is a frequent complaint in these cases, causing often such a tendency to fall that it necessitates keeping very quiet and is a reason for seeking advice. Associated with headache not infrequently is a feeling of misery or apathy, a dulling of interest in things. One gentleman mentioned his "inability to think," but cylinders of $+0.25$ D. aided him greatly in this respect. Irritability of temper, too, is mentioned. Insomnia is a frequent complaint and it is interesting to notice how speedily natural sleep returns after relief has been afforded by correcting glasses. Sleep is spoken of as not restful, as being often disturbed by dreams and nightmare. The general effect on the nervous system is such that a "nervous breakdown" is spoken of. A lady wrote to me respecting her cook who, she feared, was getting her brain affected, and yet this, together with constant headache, yielded to attention to the eyes.

Blinking and winking are, it is well-known, not infrequently met with, especially in children with eyestrain, and these symptoms disappear when the ocular defects are corrected. Less frequent are choreiform-like movements affecting not only the eyelids but the muscles of the face and even the occipito-frontalis. A young patient suffering in this manner, recently

under my care, yielded at once when his hypermetropia and astigmatism (R. + 2 D., L. + 1.5 D. with + 1 D. cyl. vert.) were corrected, whereas several months of medical treatment had failed to benefit.

Gastric Symptoms.—Vomiting and nausea are common symptoms. The former may be severe and lasting and attended with much retching. It may render a patient prostrate and necessitate confinement to bed. More frequently nausea is complained of, a sickly feeling after using the eyes. Indigestion is often mentioned or ascertained on inquiry. These patients frequently present an anxious, worn look, and the difference, when relief has been afforded to the distressing symptoms, is evidenced often very clearly in the facial expression. The symptoms differ often considerably in each patient.

It has been mentioned that nausea and vomiting are met with not infrequently in these cases. This is of considerable interest, for it is well-known that they are prominent and well-recognized symptoms of some eye diseases. An attack of acute glaucoma is ushered in with severe pain in the eye and the head and attended with violent vomiting. The bilious attack is such a prominent symptom that it masks the eye condition. It therefore receives attention; the eye is unheeded and treatment of the glaucoma is frequently deferred until sight is lost. If the reverse plan had been adopted and an iridectomy performed or even

eserine instilled a clearing up of the general symptoms would have followed and the eye would have recovered its sight. Vomiting and the so-called "bilious attack" would have ceased on the relief to the increased tension of the globe which the measures mentioned would have brought about. Another example may be given. Increased tension of the eyeball is indicated in injuries to the crystalline lens or when a needling operation for cataract has been performed, not merely by pain in the eye but often by vomiting. Here, again, removal of the swollen lens is followed by immediate relief to the stomach symptoms. The disturbance of the pneumogastric nerve by these conditions is well recognized. It is not difficult to understand that the attempts of the ciliary muscle to overcome defects should similarly influence the pneumogastric nerve. It must be borne in mind that the ciliary muscle is perhaps the only muscle the action of which is continuous. Sleep is the only time for recuperation.

Attention to the Eyes the Remedy.—The remedy for the condition met with in these cases is attention to the eyes. Over and over again in my experience relief has been afforded by the correction of anomalies of refraction. Frequently a patient expresses regret at not having obtained relief before instead of wasting time upon other measures. Usually no other treatment is necessary. A faulty state of the eyes is

ascertained; it is corrected, the proper glasses are worn, and relief follows, whilst the other conditions of life have been unaltered. This is proof sufficient. It has been well said:

“ If use of the eyes produces any of these results it is almost surely the cause; if disuse of the eyes relieves, it is doubly sure; if without the disuse of the eyes wearing of proper glasses does the same, the demonstration is beyond question ” (Gould).

In many cases which come before one, however, the symptoms have already existed for a long period and immediate relief from the wearing of the correcting glasses cannot be expected any more than that a chronic disease should at once yield to any treatment which may be adopted for it.

The Effects of Astigmatism.—If anyone wishes to learn what the astigmatic eye has through the ciliary muscle to overcome, he can do so by placing + or - cylinders before his eyes. Let him wear these glasses and they will produce the symptoms of ametropia. To illustrate, though imperfectly, the indistinctness of type which a low degree of astigmatism occasions if uncorrected by the action of the ciliary muscle, I have had a series of photographs taken of a portion of a *Times* leader. First, the leader was photographed in the usual way and appeared sharp and clear. Then under precisely similar conditions, the same was again photographed, but close to the lens of the camera a cylindrical glass

of the Russian Government to the last Japanese Note has reached Tokio, or that its tenor has reduced to an almost vanishing quantity the slender hopes which could still be entertained for the maintenance of peace in the Far East. Though the Russian Government and its mouth-pieces on the Continent may choose still to describe the reply to the Japanese Note as "conciliatory," and though in form it doubtless is so, we have reason to believe that in substance it falls entirely to meet the views of the Japanese Government. From the moment when the MIKADO's Ministers requested the Russian Government to reconsider the terms of its previous reply it was obvious that they would not be satisfied with any mere formal or superficial amendments.

Fig. 1. Normal photograph.

of the Russian Government to the last Japanese Note has reached Tokio, or that its tenor has reduced to an almost vanishing quantity the slender hopes which could still be entertained for the maintenance of peace in the Far East. Though the Russian Government and its mouth-pieces on the Continent may choose still to describe the reply to the Japanese Note as "conciliatory," and though in form it doubtless is so, we have reason to believe that in substance it falls entirely to meet the views of the Japanese Government. From the moment when the MIKADO's Ministers requested the Russian Government to reconsider the terms of its previous reply it was obvious that they would not be satisfied with any mere formal or superficial amendments.

Fig. 2. With + 25 D. cyl in front of lens.

of the Russian Government to the last Japanese Note has reached Tokyo, or that its tenor has reduced to an almost vanishing quantity the slender hopes which could still be entertained for the maintenance of peace in the Far East. Though the Russian Government and its mouthpieces on the Continent may choose still to describe the reply to the Japanese Note as "conciliatory," and though in form it doubtless is so, we have reason to believe that in substance it falls entirely in line with the views of the Japanese Government. From the moment when the Mikado's Ministers requested the Russian Government to reconsider the terms of its previous reply it was obvious that they would not be satisfied with any mere formal or superficial amendments.

Fig. 3. With +.5 D. cyl. in front of lens.

of the Russian Government to the last Japanese Note has reached Tokyo, or that its tenor has reduced to an almost vanishing quantity the slender hopes which could still be entertained for the maintenance of peace in the Far East. Though the Russian Government and its mouthpieces on the Continent may choose still to describe the reply to the Japanese Note as "conciliatory," and though in form it doubtless is so, we have reason to believe that in substance it falls entirely in line with the views of the Japanese Government. From the moment when the Mikado's Ministers requested the Russian Government to reconsider the terms of its previous reply it was obvious that they would not be satisfied with any mere formal or superficial amendments.

Fig. 4. With +.75 D. cyl. in front of lens.

1

of the Russian Government to the last Japanese Note has reached Tokio, or that its tenor has reduced to an almost vanishing quantity the slender hopes which could still be entertained for the maintenance of peace in the Far East. Though the Russian Government and its mouth-pieces on the Continent may choose still to describe the reply to the Japanese Note as "conciliatory," and though in form it doubtless is so, we have reason to believe that in substance it falls entirely to meet the views of the Japanese Government. From the moment when the MIKADO's Ministers requested the Russian Government to reconsider the terms of its previous reply it was obvious that they would not be satisfied with any mere formal or superficial amendments.

Fig. 1A. Normal photograph.

of the Russian Government to the last Japanese Note has reached Tokio, or that its tenor has reduced to an almost vanishing quantity the slender hopes which could still be entertained for the maintenance of peace in the Far East. Though the Russian Government and its mouth-pieces on the Continent may choose still to describe the reply to the Japanese Note as "conciliatory," and though in form it doubtless is so, we have reason to believe that in substance it falls entirely to meet the views of the Japanese Government. From the moment when the MIKADO's Ministers requested the Russian Government to reconsider the terms of its previous reply it was obvious that they would not be satisfied with any mere formal or superficial amendments.

Fig. 2A. With — '25 D. cyl. in front of lens.

of the Russian Government to the last Japanese Note has reached Tokio, or that its tenor has reduced to an almost vanishing quantity the slender hopes which could still be entertained for the maintenance of peace in the Far East. Though the Russian Government and its neighbours on the Continent may choose still to describe the reply to the Japanese Note as "conciliatory," and though in form it doubtless is so, we have reason to believe that in substance it falls entirely to meet the views of the Japanese Government. From the moment when the Mikado's Ministers requested the Russian Government to reconsider the terms of its previous reply it was obvious that they would not be satisfied with any mere formal or superficial amendments.

Fig. 3A. With $- \cdot 5$ D. cyl in front of lens.

of the Russian Government to the last Japanese Note has reached Tokio, or that its tenor has reduced to an almost vanishing quantity the slender hopes which could still be entertained for the maintenance of peace in the Far East. Though the Russian Government and its neighbours on the Continent may choose still to describe the reply to the Japanese Note as "conciliatory," and though in form it doubtless is so, we have reason to believe that in substance it falls entirely to meet the views of the Japanese Government. From the moment when the Mikado's Ministers requested the Russian Government to reconsider the terms of its previous reply it was obvious that they would not be satisfied with any mere formal or superficial amendments.

Fig. 4A. With $- \cdot 75$ D. cyl. in front of lens.

was placed. In this way a series of photographs was taken with $+0.25$ D. cyl.; $+0.5$ D. cyl., and $+0.75$ D. cyl., respectively, before the lens of the camera. A second series with similar minus cylinders was taken. In each case the cylinder was so placed to occasion the effects of an astigmatism "according to rule." The eye naturally strives after a clear and sharp image, and as this can only be accomplished by the action of the ciliary muscle the photographs will be understood as illustrating the strain which the astigmatic eye must undergo to accomplish this result.

Illustrative Cases.—The following cases may be given as illustrations of the class we have under consideration. The first is that of a lady who had suffered for a considerable time. She is the wife of a medical practitioner at a seaport on the East Coast, and he has very kindly written the following account for me:

"The patient, aged 32, had studied music until she was 21 years of age, spending five years in hard study in Germany. There were no eye symptoms then except headache occasionally. When working for a concert five years ago she began to have attacks of giddiness and occipital headache. These ceased after the concert, but returned with increased force twelve months later when she was again working up for a concert. On this occasion she had one or two attacks of sickness. Improvement again took place. A few

months afterwards she had some lessons in London and practiced hard, ultimately having a complete breakdown from headache, giddiness and nervous attacks. Then she gave up playing, but for a long time her general health was poor. She was thin, did not sleep well and was very nervous. She developed a cough and consulted a well-known physician nearly two years ago. He found no organic disease, but ordered her to feed up. Her general health improved somewhat, and then she began to have the typical attacks which brought her to you. The attacks came at first once a fortnight and gradually increased in frequency until she had one every week. They came on quite suddenly, sometimes when she had been feeling particularly well. She first felt giddy as if she would fall, and at the same time felt sick and faint; vomiting soon followed and lasted for several hours, with severe straining and retching. After an attack she was prostrate and confined to bed for twenty-four hours. Occipital headache was frequent and severe, as if a large crab had seized her by the nape of the neck. Occasionally an attack would come on with startling rapidity, almost like an epileptic attack. On one occasion I remember she was sitting at lunch chatting and quite cheerful. Suddenly she became giddy and nearly fell off the chair. She was pale and faint, and had to be assisted to a couch. In a quarter of an hour she was vomiting. The worst attack she

ever had come on during the night when in bed. The slightest attempt to lift her head from the pillow brought on frightful nausea and giddiness. After consulting you and wearing the glasses you prescribed she had several attacks during the first four weeks, but they did not culminate in vomiting, and she has not had an attack of vomiting since (excepting once she had a bilious attack from eating some indigestible food; on this occasion there was no giddiness and she was 'comfortably sick'; in an hour or two she was well). The attacks of headache and giddiness gradually disappeared, and she is now free from any trouble of this kind. Her general health is good and she is stouter. In every way there has been a marked improvement. For a time attendance at a theatre was invariably followed by headache and giddiness, or a long carriage drive would induce an attack, but now they simply produce a slight tired feeling. Hearing has always been acute and there has been no ear trouble. During the worst attacks the nausea was so severe that the headache was unnoticed; there was, however, a feeling as if thousands of strings were in the back of the neck and as if someone were pulling at them. The giddiness always commenced in the occipital region."

The refraction ascertained after using a mydriatic was as follows: R. — 0.75 D. cyl. = $\frac{6}{8}$; L. — 1 D. cyl. = $\frac{6}{8}$, axes vert.

The next is a more acute case and is one of considerable interest apart from the question of his headaches, for five years ago, when studying at the Sheffield Technical College, the patient was struck in the right eye by a splinter of steel which penetrated the globe and became imbedded in the retina near the optic disc. I was successful in removing this particle of steel with the electro-magnet; he recovered perfect sight which, as the record now shows, has been permanent. The patient, aged 27, is an engineer and lecturer on electrical engineering at a technical school in a great Midland city. He has always been a hard worker and the following is an account of his work during the last few years:

“From September, 1900, to May, 1901, he studied and lectured in the evenings. Considerable organ playing (music reading). August to October, 1901, engaged in engineer's drawing office (eight and a half hours a day). October, 1901, to September, 1903, two years' research work involving accurate reading of moving spot of light on mm. scale; fifty readings in one and a half hours, two or three times a day for several weeks. Plotting results on fine mm. squared paper, etc. Nearly whole time spent in artificial light (electric arc), most of work being done in the evenings. September to Christmas, 1903, reading and lecturing. There was no serious difficulty experienced with eyes during the whole of this time, except that

there was sensitiveness to strong light, which was considerable on waking and when the eyes were tired with reading. The eyes also watered on changing to a colder atmosphere, and there were slight headaches, and except just before Christmas, 1903, slight occasional sickness necessitating careful dieting. He had a fortnight's holiday last Christmas (1903), during which time he did no reading whatever, nor other eye work. This rest did not altogether give relief, so that when he returned to work he was worse than he had ever been before. For the last two or three years he noticed that his head felt 'muzzy' and it was not even recovered by the morning. The eyes would be sensitive after a hard evening's work and watered a good deal. Even when interested in his subject he was disinclined to go on with reading owing to feeling sick, and had to go out for a walk for an hour or more. He has been in the habit of giving his eyes complete rest whenever possible, and always so on Sunday, on which day no reading has been done for three years.

"After the holidays he resumed work on January 4, 1904, and read hard for five hours. On the 5th he read hard for seven or eight hours and lectured in the evening. The following day, after breakfast, he began to feel dizzy and could eat but little (not to be accounted for by the system being out of order, nor improper food). On the 7th everything appeared to be in a state of vibration. He kept his bed all day.

Much vomiting. He had no food. On the 8th was about the same; had no food, but got up for hour. On the 9th he was able to eat a small pie of fish. On the 10th he came downstairs at noon and had light diet. His medical adviser prescribed a tonic. He had to be assisted upstairs on account of dizziness. On the 11th, 12th and 13th he came down about noon daily. On the 14th, diet about normal; went out of doors for the first time, but was dizzy, otherwise felt well. On the 15th and 16th the dizziness slowly decreased. On the 16th he came to Sheffield and consulted me. On the 17th dizziness was still less. The eyes were absolutely at rest from January 7th to 17th. He has not complained so much of headache. The feeling in his head was more of general muzziness, with occasionally acute pain in the eyes and forehead. The dizziness, he mentions, is that he feels about to fall and everything around seems to be swimming."

The refraction in this case was R. $+0.75$ D. cyl. $60^{\circ} = \frac{2}{3}$; L. $+0.75$ D. sph. $= \frac{2}{3}$. Subsequently he gave this report:

"I am glad to say that I am now in normal condition, having worn the glasses continuously as you advised. The dizziness gradually disappeared, and during the last few days I have felt quite free from any indications of weakness, although I am doing a considerable amount of extra work owing to the illness of one of the lecturers here. Am doing a third of his

work (lectures, etc.) in addition to my own. Once or twice I have tried the effect of not using the glasses for an hour or two, but this gave rise to headache and acute pain at times in the right eye, not prolonged. Also the dizziness began to return."

Analysis of Cases.—It has already been mentioned that of the last eight hundred refraction cases in my private practice, one hundred and sixty-two sought advice in consequence of headaches more or less conforming to the types which have been described—that is to say, about one in every five. Dr. A. E. Barnes, a late clinical assistant of mine, has very kindly collected from my private case-books three hundred and eighteen consecutive cases of headache and has prepared for me the following analysis. (See table, p. 139.)

Sex.—Females predominated largely. This was especially the case in hypermetropia and hypermetropic astigmatism. In myopic astigmatism the preponderance was much less. The following figures illustrate this point. Of the total cases, 84 percent were females; of cases of hypermetropia, 89.4 percent were females; of cases of hypermetropic astigmatism, 89.4 percent were females; of cases of myopic astigmatism, 64 percent were females. The preponderance of females is hardly to be wondered at. Women are more subject to neurotic conditions than men. The mental or nervous stress more rapidly affects

them. Their nervous system is less stable. Women have more constant close eye work than men, and their lives are passed more indoors than men. They have more leisure for reading and spend much of their time in sewing and fancy work—the latter and “bazaar work” often being responsible for a breakdown and a visit to the ophthalmologist. It is the eye-workers, whether male or female, that are prone to headaches and the train of other neuroses which have been mentioned. These have been illustrated in the cases which have been related.

Age.—The youngest case was that of a boy, aged 6½. His refraction was R. + 1.5 D.; L. — 0.75 D., axis vert. Some time previously he had undergone tenotomy for convergent squint. There were two girls, aged 7, one had H. + 1.5 D. and the other H. + 1 D. in each eye. The oldest was a woman, aged 60, with one available eye. L. — 1 D. with cyl. — 0.75 D., vert. approx.¹ The next in age was a man, aged 52, with simple hypermetropic astigmatism + 0.75 D. cyl. in each eye according to rule (approximately). In males the ages at which eye-strain headaches are most prevalent correspond to three periods of life, *i. e.*, puberty, from 10 to 15 years; age of greatest stress,

¹ “Approximately” vertical or horizontal is used as indicating that the axis approaches one or other of these meridians. This suffices for our purpose here, but in testing, the axis must be determined very exactly if relief is to be afforded.

TABLE SHOWING AGE, SEX, AND AMETROPIA IN A SERIES OF HEADACHE CASES.

Age.	Sex.		Total.	Hypermetropia.			Hypermetropic Astigmatism (Simple and Compound).			Myopia.			Myopic Astigmatism (Simple and Compound).			Mixed Astigmatism.		
	M.	F.		M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.
5 to 10	4	2	6	1	2	3	1	—	—	—	—	—	1	—	1	1	—	1
10 " 15	9	15	24	4	11	15	3 ⁽²⁾	4 ⁽¹⁾	7	—	—	—	1	—	1	—	—	—
15 " 20	3	36	39	—	12	12	2	19 ⁽¹⁰⁾	21	—	1	1	—	2	2	1	2	3
20 " 25	8	44	52	3	15	18	3 ⁽¹⁾	23 ⁽⁹⁾	26	—	—	—	1	5	6	1	1	2
25 " 30	4	52	56	1	14	15	1 ⁽¹⁾	34 ⁽²⁰⁾	35	—	—	—	1	2	3	—	—	—
30 " 35	7	39	46	2	14	16	3	20 ⁽¹³⁾	23	1	1	2	1	7	8	—	1	1
35 " 40	2	26	28	—	10	10	1	13 ⁽⁷⁾	14	—	—	—	1	1	2	—	2	2
40 " 45	2	13	15	—	5	5	—	7 ⁽⁵⁾	7	—	—	—	2	1	3	—	—	—
45 " 50	6	11	17	—	4	4	3 ⁽²⁾	5 ⁽²⁾	8	—	—	—	3	1	4	—	1	1
50 " 55	—	4	4	—	—	—	—	2 ⁽²⁾	2	—	—	—	—	—	—	—	—	—
Over 55	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

The age was not mentioned in 28 cases—4 of hypermetropia, 23 of hypermetropic astigmatism, and one of myopic astigmatism. The figures in brackets denote the number in which there was anisometropia.

from 20 to 25 years; age when accommodation is failing, from 45 to 50 years. Myopic astigmatism is again different to the other errors, for five out of eleven cases were over 35 years of age, corresponding to the last period. In females the prevalence belongs to the period of sexual activity, for they begin to be common at 15 years, reach a maximum at from 25 to 30 years, and finally disappear at 50 years.

The Frequency of Different Varieties of Ametropia.

—As to the relative frequency of the different kinds of ametropia, it was found that the kind of error most associated with headache was hypermetropic astigmatism. Pure hypermetropia was nearly as common, myopic astigmatism much less common, mixed astigmatism still less common, whilst myopia was only present in four cases, and in three of these there was also anisometropia. The analysis of 300 cases gave the following results: hypermetropic astigmatism, 49.3 percent; hypermetropia, 34.3 percent; myopic astigmatism, 11.3 percent; mixed astigmatism, 3.6 percent; and myopia (three of which were unequal in the two eyes), 1.3 percent.

The Importance of Low Degrees of Astigmatism.—

Of particular interest in this analysis of cases of headache and errors of refraction associated with them is the large number of cases in which the degree of astigmatism is a low one and the cylinder prescribed correspondingly weak. There is in some quarters a failure

to recognize the importance of estimating these low degrees of astigmatism and the value derived from the use of weak cylinders. A careful study of the subject, however, will easily demonstrate that the low degrees of astigmatism play a very important rôle in the causation of the neuroses we have under consideration. *They will be found in patients complaining little, if at all, of their sight, and can only be detected and the exact axis ascertained after a careful examination when the eye is under the action of a mydriatic.* I refer especially to astigmatism of 0.25 D. and 0.5 D. Included in my series were 144 cases of hypermetropic astigmatism, simple and compound. I find that + 0.25 D. cyl. was prescribed in 18 cases of simple and 5 of compound hypermetropic astigmatism, or 23 cases altogether; + 0.5 D. cyl. was prescribed in 38 and 9 respectively, or 47 cases; and + 0.75 D. cyl. was prescribed in 22 and 8 respectively, or 30 cases, thus making a total number of 100 out of the 144 cases in which cylinders of + 0.75 D. and under were prescribed. The benefit of these weak + cylinders was undoubted. There were also 34 cases of myopic astigmatism, simple and compound. For these cylinders of — 0.75 D. and lower were ordered in 20 cases—viz., — 0.25 D. cyl. in 3 simple and 1 compound, or in 4 cases; — 0.5 D. cyl. in 4 simple and 2 compound, or in 6 cases; and — 0.75 D. cyl. in 9 simple and 1 compound, or 10 cases. The percentage for these weak

cylinders works out as 65.8 percent for hypermetropic and 58.8 percent for myopic astigmatism. The following is a case illustrative of the value of weak cylindrical lenses. It has been related before¹ and is epitomized here.

Illustrative Case.—In consequence of long-continued and severe headaches a gentleman, a missionary in the East, consulted me in October, 1901. The headaches had commenced about February, 1899, after considerable stress of work. They began on the left side, to which they were chiefly confined, sometimes beginning about the eye and at other times about the teeth. At first there was a sort of hot feeling which, after a time, gave place to a more acute pain, apparently like neuralgia. When pain was absent there was a numb feeling reaching from the left side and top of the head to the occipital region. The feeling was as if one side of the head was boiling hot or in flames, and he lost all energy. His sight was tested by a medical man and declared to be *above normal*, and the complaint was designated "hemicrania," "cause undiscovered" being put in the certificate. It was suggested at this time that his teeth might be responsible and he consequently had two extracted from the upper jaw. As a result of this examination he was invalided to another part of the country for six months, but he was able to do some work. The change and comparative rest were bene-

¹ *The Lancet*, Vol. II., p. 1667, 1901.

ficial and he was able to resume regular work in the autumn of 1899, continuing it until the beginning of 1901, when the headaches recurred. He was treated without avail by another medical man who regarded the headaches as rheumatic. In February, 1901, he left for England, arriving in this country in the middle of April. He was then brought before the medical board who ordered six months' rest, at the expiration of which time he was reexamined. The headaches still remained at that time, but were somewhat modified in severity. The principal medical officer could not diagnose the cause, and advised him to see an ophthalmic surgeon. He therefore came to me. At his visit I found that, though suffering from headache, it was not so bad as previously. The numb feeling was constant and there were exacerbations of more acute pain. He was of opinion that the headaches were made worse by exertion, but as he was unable to use his eyes with comfort he believed they had a good deal to do with his suffering. Vision in each eye was normal($\frac{6}{5}$) and glasses rendered it worse. After being under the action of homatropine and cocaine in each eye V. = $\frac{6}{8}$, or with + 0.5 D. cyl. axis horizontal, $\frac{6}{8}$. The muscle balance appeared to be normal. These cylinders were ordered and a week later he reported himself as improved and better than he had been for a very long time. He also added that the numb feeling in the

head disappeared when wearing the glasses, but returned on leaving them off.

He mentioned an interesting fact that two days previously after a bicycle ride the pain in the head returned, and he wished to know if cycling would be injurious. He had cycled a good deal when in the East and thought the pain had been aggravated thereby. I explained the way in which it might be so and was informed that he had been in the habit of leaning forward, and consequently, on looking straight in front of him he would have to use and strain the elevator muscles and discomfort would be caused in the same way that "academy" or "sightseers'" headache is occasioned by looking at pictures hung above the line. At a later call he stated that he had received considerable relief and was anxious to return to work and desired my permission for him to accept a curacy in the south of England. He was able to read with much greater comfort than formerly. He also said that he was satisfied as to the cause of the strain to the eyes when cycling, as he had put himself in the position I had explained, and he found the eyes to tire very soon.

On November 22 I again saw the patient who expressed himself as better and more fit for work than he had been since he first commenced his labors in the East. He was able to read with comfort for long periods and felt confident of being able to fulfil his

clerical duties, which he was to enter upon the next day. Later he obtained permission to marry and to return to his work in the East.

The Importance of Inequality of the Eyes.—Anisometropia, or an inequality in the refraction of the two eyes, is another feature to be noticed and it is important. One eye may be myopic and the other hypermetropic, or both may be myopic or hypermetropic, but the degree may be higher in one of the eyes or the degree of astigmatism may be unequal in each eye. Moreover, one eye may be normal and the other may have some form of ametropia. A consideration of my cases shows that inequality of the two eyes was present in nearly half (45.6 percent). It was most frequent in mixed astigmatism (81 percent). Myopia came next with 75 percent, and myopic astigmatism with 74 percent. In hypermetropic astigmatism it was present in 55 percent; in hypermetropia only in 21 percent. In compound astigmatism, both hypermetropic and myopic, it was relatively more common than in the simple varieties.

The Axis in Astigmatism According to the "Rule."—In hypermetropic astigmatism the axis according to the "rule" should be horizontal, and in myopic astigmatism it should be vertical. There is but little evidence from my cases to show that astigmatism against the rule is especially potent in causing headaches. In hypermetropic astigmatism there were only nine cases

against, or approximately against, the rule (*i. e.*, about 6 percent). There were also fourteen cases in which there was astigmatism against the rule combined with inequality of degree, but as anisometropia is such a powerful factor in the production of headache these cases can hardly be used to show that departure from the rule is also a factor. In myopic astigmatism there were no symmetrical cases against the rule where there was not also inequality of degree, but there were nine cases in which there was also this inequality of degree.

Asymmetry of Axes in Astigmatism.—If we do not take account of those cases in which one eye only was astigmatic we find that there were thirteen cases of hypermetropic astigmatism in which the axes were not symmetrical. This is not quite 10 percent. In myopic astigmatism there were nine cases, or nearly 25 percent.

The correction of these conditions without glasses could only be brought about by an effort of accommodation differing in the two eyes, and this, it is thought, the eyes are hardly capable of doing to any great extent. Where the difference is considerable the inconvenience is not always great and persons often only become aware of the fact that they do not see equally well with each eye when the tests for vision are applied.

In a case like that of Mrs. O., in which there was myopia with amblyopia (V. = 10 D. with 1.5 D. cyl. $\frac{6}{24}$) in the right, and hypermetropic astigmatism

($\div 0.75$ D. cyl. $= \frac{2}{3}$) in the left, the chief factor in giving relief to her headaches probably was the correction of the astigmatism in the left, though a minus spherical glass with a cylinder was at the time prescribed for the right. In a letter she says: "Before wearing glasses I used to suffer constantly from headaches and often felt nervous and irritable, with occasional shooting pains in the head and a sensation of being thoroughly run down. The use of glasses has given me quite a restful feeling, and I have had but very little headache since wearing them. I feel very grateful for the good they have done me and my general health has considerably improved."

In other cases the effort to accommodate with each eye will be made, especially in the low degrees of asymmetry, and this endeavor is often attended with considerable discomfort and headache, etc., and is an important factor in occasioning the distressing conditions which we are discussing.

The Use of a Mydriatic Essential.—If relief is to be afforded in these cases it is of the utmost importance that the refraction should be carefully and thoroughly worked out. To accomplish this the use of a mydriatic is essential. It has been pointed out that many of the greatest sufferers make no complaint of their eyesight, and unless, therefore, the accommodation is paralyzed and the exact refraction ascertained relief will not be afforded. For this purpose homatropine, especially in

combination with cocaine, is usually sufficient.¹ I generally employ it made up in gelatine discs. If these are used two or three times at intervals of ten or fifteen minutes a patient is ready for examination at the lapse of from one and a quarter to one and a half hours. The next day the effect has passed off sufficiently for the patient to be able to read with his correcting glasses. A mydriatic will reveal a latent hypermetropia of one, two, or even three dioptries not infrequently even in patients aged 35 and over, and the low degrees of astigmatism will not be discovered without it. Homatropine used in the way already mentioned usually suffices, but its employment has in some cases to be repeated daily.

Careful Testing Essential.—Retinoscopy is the one objective method that is of real value. Its discovery has rendered immense service to refraction work. For young children it must often be relied on for ascertaining the degree of the error, and it may often be necessary to prescribe spectacles from its findings. *For all others, however, the final examination must be made with the trial glasses and test-type cards. No objective method can be permitted to dispense with these.* Ascertain carefully the best correcting glasses and be very exact as to the axes of the cylinders. Attention to these matters is essential if our treatment is to be successful.

¹ Homatropine and cocaine, $\frac{1}{100}$ th of a grain of each.

Faulty Muscle-Balance.—It must not be forgotten that whilst an error in the refraction is responsible in the main for the headaches and other conditions in these cases, there nevertheless is in some added thereto a faulty condition of the muscle balance of the eyes. This, though secondary, is still an important factor, and the latent deviation must be carefully ascertained by the use of Maddox's rod and tangent scale. The close relation between the external ocular muscles and the accommodation is such that it suffices not infrequently, after careful testing, to relieve the ciliary strain by the appropriate glasses. The muscle balance becomes rectified or of less account. This is not, however, true of all cases, and the adaptation of prisms must then be combined with such correction as the refraction error requires. Exophoria, or latent divergence, is the condition most commonly met with. It occurs much more frequently than the opposite condition, or esophoria. It is often present in myopia, and in the comparatively few instances that headache is associated with myopia, apart from astigmatism and anisometropia, it may be regarded as the cause. Tenotomy of the external recti is sometimes indicated and is of service. The following case illustrates well the benefit of taking into account the muscle balance as well as correcting the ametropia.

Illustrative Case.—Twelve months ago a medical student came to me from Scotland. His headaches

were so intense and so constant that study was almost impossible; his examination had been postponed in consequence and he was considering relinquishing his medical career, at all events for a time. He had previously consulted two ophthalmic surgeons; each had prescribed glasses, but neither had ascertained the refraction as revealed by a mydriatic. He had accordingly received no benefit. Homatropine and cocaine were used by me for two days. The refraction then was R. + 0.75 D. sph., with + 0.25 D. cyl., axis vert.; L. sph. + 0.75 D. These were ordered for general use, and later for the exophoria which was present prisms 1°, base in, for each eye was prescribed. These gave complete relief; he soon wrote that he was able to do a normal amount of work, and that he was preparing with confidence for his final examination. This he was successful in passing. The following is an extract from one of his letters:

“ The prisms seem to have worked almost a miracle. I do not, of course, wish to depreciate the other factors, yet the most marked difference occurred after the prisms were worn. I am now able to read the whole day and about two or three hours in the night, a pleasure which has been denied me for more than three and a half years. The terrible photophobia, conjunctivitis, constant headaches, and utter mental depression have all disappeared. I feel quite a different person. While not expecting to have the eyes I had five years

30, it is quite an unspeakable felicity to be able to read as much as I do now and cover the work of the examination which lies before me. It is impossible to realize that for periods of three months at a time I was hardly ever free from severe headaches, that I was unable to look at a book for six weeks at a time, and that this state of sublimated mental and physical torture lasted for some years."

At the close of last year he wrote saying he had ceased for a time to use the prisms, wearing the correcting glasses alone, but as he felt the old symptoms returning he was taking to the prisms and again finding the same relief.

Vertical deviations are less frequent than lateral, but in my experience they have been associated with severe headache. One case was that of a nurse who was frequently laid up and who had been obliged for a time to give up her occupation. I found in the right eye mixed astigmatism ($+0.75$ D. vert., -0.25 D. horizontal) and in the left simple hypermetropic astigmatism (0.75 D. vert.). Glasses were ordered combined with prisms correcting the vertical deviation. Very considerable relief was experienced.

Academy Headache.—A word now as to "academy" or "sightseers'" headache, or, as it is called in America, "theatre headache." There is no doubt that astigmatism or some other form of ametropia is a factor in its production. But a proper correction of

such defects will not always prevent this kind of headache, and I feel certain that there are other important influencing conditions.¹ A lady mentioned that she suffered so much from headache after attending a play that she ceased to think a visit to the theatre was worth the after-suffering. It was also ascertained that she visited the pit and it was the effect of looking up at the stage that she found distressing in the after-effects. When sitting in the dress circle and looking on to, or down to, the stage she experienced less ill results. My investigations into the conditions causing the nystagmus, or rolling of the eyes, met with in miners, showed that it was due to the weariness induced in the elevator muscles of the eyeball by the constrained position in which the miner had for long periods together to cast his eyes when engaged in working the coal. My observations in compositors, plate-layers, and many other occupations, indicated, moreover, that prolonged use of the elevators tended in them also to produce nystagmus, but that in many instances only discomfort and aching of eyes were complained of. I believe also the cause of academy headache is in many cases to be found in this throwing the gaze above the horizontal line, especially without a corresponding uplifting of the head. Watch the visitors to a picture

¹ "Acquired Nystagmus in Occupations other than Coal Mining," *Transactions of the Ophthalmological Society*, Vol. XVI., and "Miners' Nystagmus" (J. Wright & Co.).

gallery and it will be observed how often this turning upwards of the eyes is required, especially when the paintings are hung above the line, and careful observation will show that many of the same visitors will compensate for this movement above the horizontal by a backward motion of the head. Anyone may try this for himself and observe the tiring effects occasioned by looking at pictures more or less "skied," and then notice the difference of looking at the same objects, but relieving the elevators by at the same time throwing the head backwards. The collier with nystagmus learns to steady his eyes by turning them downwards. And it will have been noticed that the lady before referred to had herself observed the difference in looking up at the stage from the pit and looking down from the dress circle.

Cycling a Cause of Headache.—Cyclists suffer from this kind of headache, particularly those who lean on the handle-bars with the head lowered, when if they look forward the gaze is necessarily directed above the horizontal line. I have already related a case in which a return of the headache resulted from a rather long cycle ride. As previously stated, on questioning the patient it was found that he was in the habit of looking in the direction I have suggested as occasioning weariness of the elevators and consequent headache. The accuracy of this observation he was able to endorse from tests which he made himself. I mention this par-

ticularly because I think that it is an explanation of the headache or eyeache sometimes complained of by cyclists, and the cause once recognized admits of easy remedy.

Conclusions.—We may summarize what has been written under the following conclusions:

(1) That eye-strain is the cause of a large proportion of headaches, often of a very aggravated character.

(2) That various other neuroses are met with in association with headache, and among these may be mentioned the following: Mental depression, nausea, indigestion, vomiting, insomnia, giddiness, choreiform movements of the eyelids and face, etc.

(3) That relief is afforded to these conditions by correcting the error of refraction, which can be ascertained only after careful examination.

(4) That for such examination a mydriatic is absolutely essential.

(5) That frequently no complaint is made of defect of vision.

(6) That the ametropia is frequently of low degree, 61.2 percent of my cases needing 0.75 D. cyl. and weaker.

(7) That a cylinder of 0.25 D. is of great value.

(8) That anisometropia is frequently present and requires proper adjustment.

(9) That in a certain number of cases the muscle balance is faulty and necessitates the prescribing of prisms.

SLIGHT ERRORS OF REFRACTION
AND THEIR INFLUENCE
ON THE NERVOUS
SYSTEM.

CHAPTER V.

SLIGHT ERRORS OF REFRACTION AND THEIR INFLUENCE ON THE NERVOUS SYSTEM.¹

BY C. ERNEST PRONGER, F.R.C.S.,

Ophthalmic Surgeon to the Harrogate Infirmary, England.

HAVING been asked to read a paper to the members of this Society, my first thought was to select a subject which would be of interest to all of us in our every-day practice, and the discussion of which might be of some real practical use.

The subject which has suggested itself to my mind is the consideration of some of the results of uncorrected errors of refraction, more especially those connected with the nervous system, and the association of errors of refraction with some of the nervous diseases you are so constantly called upon to treat.

I do not wish to speak to-night of the higher degrees of refractive errors, the effects of which are usually obvious and at once attract notice, but rather of those slight degrees which I find are so constantly over-

¹ A paper read before the Harrogate Medical Society, and reprinted in the present volume by the kind permission of Mr. Pronger.

looked, and yet whose influence upon the nervous system may be so far-reaching and disastrous.

The cases which I would have you consider are those which in themselves have little or nothing to draw attention to the eyes, and unless you have had previous experience of them, it is little to be wondered at if, in many instances, the real cause of the malady and in others a very important element is entirely unrecognized. I say this because the text-books on medicine seem to attach so little importance to the subject of refractive errors, and, so far as I know, the attention of the student is but little drawn to it during his hospital career.

The most important of these nervous ailments is, probably, headache, on account of the vast numbers who suffer from it, occurring as it does at all ages from six or seven years of age to sixty or more. It is very common during school life, and how much of the suffering we see in after-years might have been obviated had the real cause been detected at that period.

There is no special characteristic by which eye-headaches can be diagnosed. They vary in intensity from the dull aching across the brows, not much more than a sense of weariness, to the intense pain in the head, often with retching and vomiting, which completely prostrates the patient, and the effects of which sometimes last for days. The pain may be a dull aching or of sharp neuralgic character, and the situation of it is

very varied. It is often in the mastoid or occipital region, or it may be either across the top of the head or the brows, or limited to one side, and I have sometimes had cases in which the pain has been between the eyes, just at the root of the nose, in which glasses have given complete relief. In a large number of cases of headache there is no suspicion, either on the part of the patient or the doctor, that the eyes have anything to do with it, for the reason already given, and from the fact that nausea, retching, or vomiting is present in many cases, these are almost invariably attributed by the inexperienced to some disorder of the liver or digestive organs, forgetting that vomiting is also frequently associated with nervous disturbance.

But if the doctor be fully alive to the fact of eye-trouble being a very frequent cause of headache, and make inquiries as to the sight, many obstacles may be put in his way; for instance, he may be told that the sight is perfectly good, and truly, for the vision often comes up to the normal standard in each eye; that the sight has been tested, and that the glasses are quite satisfactory, for so they may be to the patient, from a visual point of view. Then again, the patient is often very sceptical, and may pooh-pooh the idea altogether.

I would strongly advise you in all cases of persistent or frequently recurring headaches to have the sight tested, and the testing, to be effectual, should be very

carefully and thoroughly done, and if the symptoms still persist, repeated, for these cases of slight refractive error are much more difficult to diagnose and correct than is generally supposed. One other point—if you decide to send your patient to an ophthalmic surgeon, be emphatic and convey to the patient that it is a matter of some moment, or your advice will often be disregarded.

In selecting cases, in illustration of some points which I wish to impress upon you, I have chosen those which have been under some member of this Society or of some well-known medical man in this district, and the first is that of a daughter of a medical man, who brought her to me in April of last year.

Case I.—Her age was 16 years, and she had been suffering severely from headaches for five years, so much so that her school career had been quite spoiled by the frequent interruptions in her studies.

She had had a good deal of treatment by drugs, rest, and frequent changes of air. Her father told me that all the possible causes of headache had been carefully gone into, and she had been taken on several occasions to an ophthalmic surgeon, but, unfortunately, without success. I need hardly tell you that with such a history I exercised the greatest care in dealing with her case, and I had the satisfaction shortly after of finding that, as a result of making a slight alteration in her glasses, which were for the correction of myopic astigmatism, her headaches became less severe and less frequent, and she has now been for six months almost entirely free. Having extended over five years, this illustrates not only the difficulty (and no trouble seems to have been spared) of finding the

cause, but also how difficult some of these slight astigmatic errors are to correct accurately.

Case II.—A medical man consulted me, some years ago, on account of a small meibomian cyst, and I mentioned that in my experience these cysts were almost invariably associated with errors of refraction. (As these cysts are very common, you will do well to bear that in mind.) He at once said that he must then be an exception to my rule, for he had had his sight tested by an eminent oculist and that it was quite normal. Acting upon a principle which experience has taught me, never to accept anybody's estimate of refraction without verifying it, I tested his sight, and soon convinced him that he had astigmatism.

He now told me that he suffered much from headaches, brain weariness, and exhaustion when at his work. On wearing glasses for the correction of his astigmatism he soon obtained complete relief.

Another point in his case, although not very uncommon in astigmatic patients may be new to some of you, was that if he travelled any considerable distance by rail, say to a medical dinner, he would suffer so much from nausea at the end of the journey that he would be unable to eat a thing.

With his glasses on he can now travel to town and eat as big a dinner at the end of the journey as at any other time.

This was to me a very interesting case. That tiny meibomian cyst brought the patient to me; it told me that there was some error of refraction; that error of refraction was so slight that it had escaped the observation of an ophthalmic surgeon; so slight that it had caused no appreciable impairment of vision, and yet so powerful as to cause a great deal of headache in a strong, healthy man, and undue weariness and exhaustion when at his work; to render railway travelling to him a thing to be dreaded, and lastly, if my theory be correct, to play an important part in causing that tiny cyst.

The cure of ordinary headaches by glasses is now so

well known to the general public, that patients frequently come to me, both at the Infirmary and in private practice, telling me that they can see perfectly well, but that they have heard of a friend whose headaches had been cured by wearing glasses, and that they would like to have their eyes examined.

That being so, I do not wish to enlarge unduly upon this subject, when speaking to a body of medical practitioners, but would like to devote a few minutes to the more severe forms of headache which I often have to treat, and which have almost invariably passed through several hands before coming to me, showing that there are some at any rate who do not readily recognize the cause of the trouble in these patients.

This type seems to be commoner in women than in men, and the attacks of severe pain in the head, with, usually retching or vomiting, come on at intervals of a day or two, to two or three or more weeks. The patient is quite prostrate during an attack, and in extreme cases the after-effects have barely passed off when a fresh one occurs. The nervous system becomes shattered by such severe suffering, and life becomes a misery. Patients have sometimes told me they have often wished themselves dead.

Case III.—Mrs. B——, at 56, a sufferer from these attacks, came to me in October, 1901. The doctor who sent her wrote that she had been a terrible neurotic or rather neurasthenic sufferer for many years, and that for ten or fifteen years,

frightful attacks of sick-headache had prostrated her over and over again. She had never worn glasses, for, being short-sighted, she had been able to read small print until quite recently, but as her sight for reading had now rather failed, he wished me to prescribe glasses "for that purpose."

This proved to be a case of astigmatism of different degree in the two eyes, and I prescribed glasses for constant use, with suitable correction in addition for reading. I told her doctor what I had prescribed, and expressed the opinion that the attacks from which she suffered were caused by the astigmatism, and that they would be much benefited if she persevered with her spectacles. He told me I had no conception of the severity of her attacks, and scouted the idea that attacks such as hers could be due to so simple a cause or cured by so simple a remedy. Twelve months later this patient came again to Harrogate, and meeting her doctor one day I inquired after her. He reported that she was wonderfully better—he had not seen her looking so well for years, and he then went on to say that on leaving Harrogate his patient had gone to stay at Malvern, and that "Malvern had so completely set her up that she had had hardly an attack since." I inquired about the spectacles, and was pleased to find that she had worn them constantly.

Case IV.—A photographer, age 57, consulted me in October, 1901, stating that he had had frequently recurring severe headaches, attended by vomiting, for some months, and that his family doctor had attended him for several weeks without benefit. (This doctor told me afterwards that he had asked about the eyes and had been told that the sight had been tested, and that the glasses were quite satisfactory.) Finding that he got no better, he went to another doctor, who advised him to consult me, but he was sceptical, and thought it rather a far-fetched idea that the eyes could have anything to do with, what he looked upon as, his attacks of indigestion. He therefore ignored this advice, and tried a third, who expressed to him the same opinion. He thought now that there must be something in it and came to me.

I found simple hypermetropia in the right and myopic astigmatism in the left eye, and prescribed glasses to be worn constantly. He met me in the street eighteen months after this, and told me he had had only one attack since the change in his glasses—that that one followed a “special occasion” in his family, and could be accounted for on other grounds.

I see a great many sufferers from this severe form of headache, and the usual history is one of many years’ duration, and of consultations with many doctors, but that until now no one had suggested testing the sight.

Another condition which we hear a good deal of now-a-days is insomnia, and the frequency with which it is met with as a symptom among my patients has led me to consider whether some error of refraction may not in some cases be an important contributory cause of this trouble—in fact, I would go further and suggest that in some cases, at any rate, it is the primary cause. I believe insomnia is generally attributed to overwork, worry, and anxiety, and the treatment prescribed is rest, change, and the use of sundry drugs.

But insomnia sometimes occurs in those who do not work hard, and have no special worries or anxieties; and insomnia is sometimes cured in those who are hard workers without any change or diminution of their labors. There must, then, be room for another cause, and another method of cure, for some of the sufferers from this troublesome malady, and I would suggest that, in any case of insomnia you may have to treat,

you bear in mind that possibly error of refraction may be the cause, and glasses the cure.

Case V.—In July last a young man of twenty came to me complaining of sleeplessness. He was reading for an examination for the army. He had slight hypermetropic astigmatism, the correction of which at once gave relief, without any relaxation of his studies. This was a simple case, and readily cured, but it was a very important one, for it would have been a very serious matter to him if he had been ordered to give up his work and go away for a change.

Hewetson, writing in 1888, says this symptom (insomnia) I observed in many cases of astigmatism, and he mentioned the case of a University student who was astigmatic in whom the insomnia was cured when the astigmatism was corrected, although he continued to do the same amount of work.

Case VI.—I have just received a letter from Mr. B——, aged 50, who consulted me not long ago for headaches, and who told me that he had been for fifteen years a great sufferer from insomnia. He had myopic astigmatism, for which he has since worn glasses, and he writes to say that he now sleeps “splendidly.”

Vertigo is another of the troubles often due to error of refraction, and I will relate just one case:

Case VII.—Mrs. A——, aged 48, was sent to me in August last by her doctor, who reported that she had suffered for a considerable time from frequent attacks of giddiness, for which he had been unable to assign a cause. I found hypermetropic astigmatism of different degree in the two eyes, which I corrected, and she has since written me that the wear-

ing of spectacles at first caused some embarrassment and difficulty in estimating distances, but the attacks of giddiness had, as she expressed it, reached "the vanishing point."

Slight errors of refraction, dating as many of them do from birth, seem to have a very gradual injurious influence upon the nervous system, similar to the dropping of water upon a stone, and those who are the subjects of them are usually of the highly-strung, sensitive temperament.

We frequently see nervous disturbances in children speedily relieved by the correction of these slight defects. Later on we have the satisfaction of seeing many serious nervous phenomena entirely disappear on wearing suitable glasses. Unless these slight errors of refraction are corrected, sooner or later they make themselves felt, and appear to gradually undermine the nervous system.

Owing to this slow action, and to the fact that in many cases there is little or no impairment of vision, their injurious influence often goes on for years, and the cause of the troubles to which they give rise is quite unsuspected.

I want to suggest for your consideration the possibility of some of the neurasthenic conditions being brought about in this way.

I have seen patients in whom I have thought this to be the actual cause of the neurasthenia, and I have seen others in whom I have thought that the soil, as

it were, had been prepared in this way, and that stress of work, worry, and anxiety had brought matters to a crisis.

Undoubtedly errors of refraction are very common in neurasthenia, in fact I should be interested if any of you could send me a case in which the refraction is normal in the two eyes.

Some of these neurasthenic cases, in which the cause has, for instance, been ascribed to overwork, worry and anxiety, seem to drift on with no permanent benefit long after these conditions have been done away with, and often, in spite of rest, travel, Weir Mitchell treatment, and many other remedies.

Does not this make one think that there must be some subtle influence at work in the background? and as I so constantly find astigmatism present, it strikes me as very strange, when patients tell me that of all the many doctors whom they have consulted, no one till now had ever suggested that the eyes should be examined.

I should like to mention a few cases of a neurasthenic type, in which the eye defect has appeared to have an important influence, and in which the correction of it has undoubtedly been helpful in the treatment.

Case VIII.—Mr. N——, aged 57, consulted me in February, 1895, with the usual train of nervous symptoms, extreme depression, headaches, nervousness, etc. I found he

had hypermetropia of different degree in the two eyes—he had worn glasses for reading only, and these were of the same strength for each eye. His vision was quite good. He had been constantly under treatment of one sort or another for many years, but he now quite despaired of ever being any better. When eight years had elapsed since his visit I wrote to him and asked him to report, and will read you his own account:

“About twenty years ago I gradually broke down in my nervous system, and could not attend to business, as my nerves were so shattered, and for years I was often completely prostrate with nervous exhaustion. During that time I consulted about a dozen doctors in different parts of the country, but without relief. The only relief I could find was in change. Ultimately I broke up my home and travelled from place to place, and often was able to stay only a short time in one place, as the sameness seemed to play upon my nerves to such an extent that I was miserable until I changed again. During those years I lost, very gradually, about five stones in weight; in fact, I had no idea whether I should live or die. About eight years ago, when I came to you in the condition I have described, I had not worn glasses except for reading, in fact I never thought of doing so, because I could see splendidly and practically any distance. You advised me to wear glasses always, and I have done so ever since, and very gradually, but very surely, I began to gain weight and to be better in every sense of the word; so much so that my friends are surprised to see me as I am.”

In September last, when he came to Harrogate to bring his wife to see me, I was struck with his greatly improved appearance and cheery expression, and jokingly asked him how much doctoring he had done since he last came to me. He told me he had had influenza and erysipelas about two years ago, for which he was medically attended, but that that was the only occasion since his visit to me. Certainly, a great improvement took place in this patient, and has been main-

tained, and there was no change in his circumstances or surroundings to account for it except the wearing of glasses.

Case IX.—Mrs. P——, aged 36, consulted me on July 10, 1896. Very neurotic, always short-sighted, but had not worn glasses. Last few years had suffered much from headache, sleeplessness, great depression, and extreme irritability. She had tried several of the Continental health resorts; and had just returned from a voyage round the world, attended by a trained nurse, which had been prescribed for her by a nerve specialist, but from which she had derived little benefit.

I found she had myopic astigmatism of different degree in the two eyes, and prescribed spectacles, but had the greatest difficulty in getting her to wear them. She resented them on account of the appearance, and would not understand that they could have anything to do with her general health. I think, too, that she felt that a pair of spectacles was a great come-down, after the more elaborate prescriptions to which she had been accustomed, especially as she had been sent to Harrogate for a course of waters and baths. After a great deal of talking, she got a pair of spectacles, but in two days the nurse came to me and said she had taken them off and pitched them across the room. You see how very irritable she was; most patients would have laid them on the table. I again reasoned with her, and eventually she wore them continuously, and in three weeks found she was getting benefit from them—she began to sleep better, and the sleeping draughts which she had been taking were dispensed with.

After she had worn her glasses five weeks, she had an accident and broke them, and sent an urgent message to the optician to have them repaired immediately, as she could not get on without them.

I saw her on August 25th, before leaving Harrogate, and found her better in every respect, and four months later she reported herself as being very much better, and with care, very free from nerve trouble.

This was a very wealthy patient, who had sought advice from many sources, and any treatment suggested could be carried out, but no one seemed to have paid any attention to the eyes until the doctor to whom she had been sent in Harrogate advised her to consult me. My difficulties in adapting glasses in this case were much increased by the fact that the patient was very sceptical, very sensitive, and so irritable that the process of testing the sight was a great tax upon my patience as well as upon hers.

Case X.—The next was a much simpler case—more recent, less severe, and the patient very amenable to treatment. She was married, aged about forty, very energetic, and highly-strung temperament. She was a great reader, and got through a good deal of needlework as well.

Two years ago, she had quite a breakdown of her nervous system. She had no headaches, but great depression, felt utterly incapable of attending to her household duties, was sleeping badly, and as she expressed it, felt that she was not herself at all. As tonics, etc., seemed to have no effect her doctor sent her into a nursing home, where she had five weeks of Weir Mitchell treatment, from which she derived much benefit and kept fairly well until the spring of last year, when the same symptoms as in the preceding spring all began again, and I was asked to examine her eyes. I found slight hypermetropic astigmatism, for which I prescribed. She had just returned* from a week at Scarborough, but with this exception no other special treatment was adopted. She gradually recovered her nerve tone, and I saw her last month, looking, and expressing herself as feeling quite well.

The simplicity of the treatment and the expense on this occasion were in strong contrast to the experience of the preceding year.

Case XI.—The next case, which I saw in October of last year, is so graphically portrayed by the patient herself that I cannot do better than read to you her reply to my inquiry as to her present condition. In this case there was hypermetropic astigmatism of different degree in the two eyes, but with quite good vision. I ordered glasses for constant use. She writes as follows:

“I have had severe neuralgia for more than twenty years, but for the last four or five years the pain has been increasing, both in intensity and frequency. About two years ago I collapsed, and was treated for ‘nervous prostration.’ I had always been very sick with every attack, but the sickness got much worse, and I was quite an invalid. I had no memory, and was in a miserably nervous state, and worst of all, I think, I was morbid. When I went to see you in October last I was having about three attacks of violent pain and sickness almost every week. I could only crawl along, and was never trusted out alone. I daren’t cross a road, and could not bear to look at anything painful. You may perhaps remember that when I saw you again in December, I was alone, and had gone to Harrogate from Manchester by myself. The attacks had quickly diminished to about five or six in the two months, and I had been only slightly sick. I have gone improving at the same quick rate, and it is more than a month since I was sick at all. I have within the last month nursed my two girls through influenza, and have not had a bad attack of pain. I can walk quite well and am not afraid to cross a road. I feel alive and happy, and can trust my own judgment of things once more. We had all made up our minds to my being a helpless sufferer for the rest of my life, and I am now more active than I have been for years, more cheerful, and sane altogether.”

As no other mode of treatment was being tried in this case, there is, I think, little room for any misconception as to the cause of the truly distressing state

this patient was in, and so well described by her, no as to what this great improvement is due.

Just one other case, which I saw in 1894, shows, I think, that the eye-defect was unmistakably the starting point of the nervous troubles, and that the glasses were as assuredly the cure.

Case XII.—Miss P——, aged 30, had suffered much during school life from sick-headache, being often absent on that account, but her sight was not tested. As she grew older, other symptoms developed, giddiness, and extreme depression, and she became so nervous that she could hardly bear to sit in a room if many others were present. At twenty her condition became so serious that she was under medical treatment for three months, and a grave view was taken of her case. It then occurred to her doctor that it would be desirable to have her eyes examined. She was sent to an oculist, astigmatism was diagnosed and glasses ordered. She soon began to mend, and eventually got quite well. She came to me in 1894, complaining that all the old symptoms which she had entirely lost for ten years were returning.

I examined the eyes, and my results exactly coincided with the glasses she had, so there could be no change in her refraction to account for her relapse. I then asked her to put on her pince-nez, and found that the horizontal spring was worn out, so that the axis of the lenses was quite altered, and the glasses were not fulfilling the purpose for which they were intended. I advised the repair of her pince-nez, which was carried out. She soon got quite well again, and has had no trouble since.

This case speaks for itself.

I will now pass on to true epilepsy and petit mal, but do not propose to read any cases, for in these

ailments other methods of treatment, notably by bromides, are invariably being used, so that one's results are always open to doubt. I will therefore confine myself to the statement that some error of refraction is very commonly present and that the correction of it tends unmistakably in my opinion to mitigate both the intensity and frequency of the attacks.

I will allude to one other type of nervous trouble—that in which the hysterical element predominates. This class has, I believe, become more restricted now than in the days of my earlier experiences, when my labors were not confined entirely to eye work, but when I had to examine patients from the general practitioner's point of view and not only through the spectacles of the specialist. For instance, some of the cases which are now called neurasthenia would have probably been included in this category.

What is it that causes in the first instance that perversion of nerve force which gives rise to the condition we speak of as hysteria? The very fact of so many causes of the initial irritation of the nervous system having been suggested and the difficulty of giving any actual demonstration of the presence and mode of action of such suggested causes, make one feel that this is still a question that has to be solved.

I should like now, briefly, to relate two or three cases which seem to me to be of interest, and which

supply some suggestive material for reflection in connection with this abstruse subject.

Case XIII.—I was asked to see the following case on October 4, 1894. Miss M——, aged 32, was in bed, and complained of being unable to open the eyes as she could not bear the light. She had kept the eyes tightly closed for a fortnight in a darkened room. Having made up my mind, from such examination as I was able to make, as to the nature of the case, I put some cocain drops into the eyes and told her to keep them firmly closed and to make no attempt to open them for five minutes, and that she would then be able to open them as well as ever. During this interval I listened to further details of her history, and will now read you an abstract of a very long written account which she had sent me of her experiences from sixteen to thirty-two years of age:

“Fairly strong until 16 years of age (1878), when ‘nervous debility’ came on—grew weaker and lost the use of her legs and could not sit up, and for ten years was always either carried or wheeled about in a chair, and for six years after this could only move about the house with the aid of a crutch. In 1881 her spine was cauterized, causing terrible pain and increased sensitiveness. In 1882 confined to the couch for several months, and had the first attack in the eyes, inability to open them and could not bear the light. These attacks recurred every November or December for 12 years, lasting on each occasion three or four weeks. After this she was sent to a nursing home for electricity and massage, and to be separated from her friends, and remained seven months with little benefit. Residence in the country and at the seaside were both tried, sometimes gaining a little, and then relapsing. In 1885 and 1886 tried electricity, but derived no permanent good. Continued much in the same state until 1894, when I first saw her.”

At the end of five minutes she was able to look about the

room quite comfortably, and there was nothing abnormal to be seen in the eyes. I ordered cocain drops and said the eyes would be quite well in two days, and she was then to come to my house that I might test her sight.

She arrived, and with the aid of a crutch under one arm, a stick in her hand, and supported by her sister (a trained nurse), came into my consulting-room. I found myopic astigmatism in the right and simple myopia in the left eye, and ordered spectacles for constant use.

Three months later she came to me unattended. She had discarded the crutch entirely, but told me she carried a stick out of doors as she did not yet feel quite confident of her walking powers.

I saw her again in 1895, in November, and found her greatly improved in every respect, and able to walk about by herself.

It is now more than eight years since I first saw her—the improvement which took place has been maintained, and a point which I wish to emphasize is that there has been no fresh development of any hysterical symptom.

Case XIV.—In July, 1898, Miss H——, a healthy-looking girl of eighteen years of age, was sent to me by her doctor with a history of attacks of inflammation in both eyes which had defied all treatment for seventeen weeks—frequent, sudden attacks of great congestion and much watering of the eyes, and lasting for a few hours only. There was nothing abnormal to be seen at her first visit to me, but on testing the sight, I found myopic astigmatism, and ordered glasses to be worn constantly, and some boric acid lotion to be used for three weeks. At her next visit an attack came on very opportunely in my waiting room. On carefully examining the eyes I found a minute foreign body inside the lower lid, which on examination with the lens looked like vegetable matter. I put this aside for further examination—had the eyes fastened up with compress and strapping so that she could not get at them for three days, during which time no attack occurred. In the meantime I came to the conclusion that there was some-

thing of the nature of the onion about that foreign body; so I spoke to the girl alone, told her I now knew the cause of the attacks, and that she must not have any more of them or her parents and her doctor would have to be told. The cure was complete, and again in this case there has been no fresh development of a hysterical nature after five years of observation. It is also noteworthy that in this case, as in the last, astigmatism was present, and that in both instances the eye was selected for the hysterical manifestation.

Case XV.—My last case is described by the doctor who sent her to me, and who writes as follows:

"Mrs. S——, who is over the climacteric, has for the last twenty years been subject to peculiar attacks of unconsciousness, coming on without warning or apparent cause. I found her in one in my waiting-room to-day—the first I have seen. She had just come in, asked the servant for a drink of water, but before it could be fetched, lapsed into unconsciousness. Color good, pulse regular, breathing regular, but very faint, twitching of eyelids, conjunctival reflex almost absent, pupils equal, slightly contracted, but reacting to light. She remained in that condition for nearly two hours. The attacks seem to me to be of an epileptic nature, but without any convulsive action. She is a neurotic subject, but on looking for a peripheral irritant to the nervous system I could only find it probable in the eyes, and a history of headache (occipital more than frontal), so send her to you to see if you can find any cause in the eyes, and if suitable glasses will do anything to avert the attacks."

I found hypermetropic astigmatism in the right and simple hypermetropia in the left eye, and on the correction of this no more attacks occurred, and after five years' observation no fresh developments of a nervous character have arisen.

Many matters of the greatest importance often have very trifling beginnings, and yet when we reflect upon the picture of suffering and misery presented to us by

some of the cases I have quoted it seems almost incredible that it could have been brought about by so small and apparently trivial a cause as a slight error of refraction.

But as we have seen it, beginning in early life, slowly and obscurely, but surely, bringing its pernicious influence to bear upon the nerves more and more energetically as age advances.

Finally, if undetected and untreated, we have seen it gradually undermining the whole nervous system, and we find the sufferer in a state of hopeless despair.

When I think of the incalculable amount of suffering which might be averted if, by careful and painstaking observation, the earliest indications of nerve trouble were noted, I feel that I cannot be too emphatic in urging you always to bear in mind the vast possibilities and far-reaching effects of these apparently trifling errors of refraction.

MR. PRONGER'S SECOND PAPER.¹

Two years ago I read at a meeting of this Society a paper on the influence of slight errors of refraction as a starting point of many functional nerve troubles, quite apart from any impairment of vision or local discomfort to suggest eye trouble. I mentioned some of the commoner remote effects of eyestrain, such as migraine and the various forms of headache, in-

¹ March, 1905.

somnia, vertigo, depression, irritability, choreic movements of facial muscles, and various troubles usually treated as disorders of the liver or stomach.

Having referred briefly to epilepsy, petit mal, chorea and hysteria, the question was submitted for your observation and consideration as to whether the real starting point of those various symptoms to which the name neurasthenia has been given might not be slight error of refraction; that the soil being prepared, as it were, by its insidious harmful effects, the supervention of shock or any one or more of the long list of causes of neurasthenia which have been suggested might not bring about the crisis or breakdown which at first sight would be looked upon as the beginning of the condition of neurasthenia.

Your reception of my paper was most gratifying to me, and it has been still more gratifying to note that the large majority of you have put to a practical test the propositions submitted to you. Some, of course, were sceptical and a few scoffed, and it was remarked that "Pronger was going to cure everything with spectacles"; and, in reply, I ventured to predict that we should in time hear much more of this subject. My paper, read and printed in March, 1903, was followed in September by a long article in the *British Medical Journal* on a book on "Biographic Clinics," brought out by Gould of Philadelphia; and it was very pleasing to me to find that many of the main points

advocated in that book were identically the same as in my own paper.

From the dates given in some of the cases in my paper it will be seen that this special subject has engaged my careful attention for more than ten years—my first paper on this subject was in 1895—and Gould, in a letter recently received from him, tells me he has long been urging this subject upon the profession.¹

Now, when two men, working upon the same lines and quite independently for some years, arrive at practically the same results, it would seem probable that their conclusion would be fairly accurate. More especially should it be the case in regard to these slight errors of refraction, seeing that many of the remote effects of the higher degrees have been recognized and recorded.

In continuation of my paper of two years ago, I want to say something about neurasthenia, if I may venture to discuss a subject which has hitherto been generally looked upon as quite outside my department and belonging almost exclusively to the province of medicine.

Now, if we consider for a moment the many suggested causes of neurasthenia, and let us take, for

¹ I read a paper before the British Medical Association in 1894, published in *British Medical Journal* September 15, 1894, upon "Low Degrees of Ametropia and Their Results as Systemic Diseases."—G. M. G.

example, a very common one, worry, we are at once struck by the fact that out of large numbers subject to this influence, only one here and there actually breaks down under it. Is it that the worries and anxieties of these few are so much greater than those of the others? or is it that the nervous system is less stable, that there is some predisposing cause which renders it less able to resist the tax put upon it?

We might go further, for in many cases of neurasthenia one of the earliest symptoms observed is a disposition to worry about the merest trifles, and in such cases, if really great worries or anxieties were to crop up, a breakdown would readily occur. Is the worrying cause or effect?

It behooves us, therefore, to search for such a cause as would be likely to so affect the nervous system as to predispose it to break down under the influences which have been suggested as the causes of neurasthenia.

We have such a cause in refractive error; and this is not merely a theoretical suggestion on my part, but the conviction which has resulted from actual observation of large numbers of cases during many years, and the careful following up of the results of treatment. A rather striking instance occurs to me which illustrates the point I wish to impress upon you. A few years ago I prescribed glasses for a medical man well known to you all for the correction of astigmatism, in spite of the fact that up to that time he had consid-

ered that his eyes were normal; in fact, they had been tested and he had been told so. Some time after this he had occasion to go over to Ireland, as he had frequently done before, but had always dreaded the journey, as he was invariably violently sick. On his return he came to me and told me that he had had a very rough passage both ways, but he had not been in the least sea-sick, and that he attributed this to the glasses. In this particular instance the motion of the sea was not by itself sufficient to upset him, the additional influence of that slight error of refraction having been removed. The scepticism with which this incident would be received by many, and the ready explanation given that it was merely a coincidence, suggest that I should pursue the case a little further. The same patient was also a great sufferer from train-sickness, a not uncommon result of astigmatism. With his glasses on he can now take a long journey without inconvenience. Here again the train journey would be the obvious cause of his trouble, the more important, but less apparent, cause being slight error of refraction.

It seems to me not unreasonable to suppose that the same thing might happen in other functional nervous derangements, and why not in some of those conditions called neurasthenia?

I will now take two cases of neurasthenia having many points in common, in which this contention appears to be borne out.

J. L. B., æt. 51, married, consulted me May 8, 1903. Led an outdoor life, learning farming until 24 years of age, and enjoyed good health. He then began to study for the ministry, but his studies were much hampered by severe headaches. He persevered, became a minister, and eventually occupied a position of great responsibility, and which involved much hard work and anxiety. He began to suffer severely from insomnia, vertigo and extreme depression and finally his nervous system broke down completely. He was treated as these cases usually are: first, by his family doctor and afterwards by another, both personal friends, who took the greatest interest in his case. He also saw an ophthalmic surgeon in town, who prescribed glasses which might be used for reading, but the patient seldom used them, as he could see well enough both for distance and near work for all visual purposes. A London consultant then advised a prolonged stay in Switzerland, and this was carried out, but with a most disappointing result. A course of treatment at Woodhall Spa was next tried, but being no better he was afterwards sent to Harrogate. The doctor whom he consulted sent him at once to me, and abstained from any other treatment, as he wished to see if spectacles would have any effect. The patient told me he could see quite well and did not believe the eyes could have anything to do with it, but was willing to try anything, although he quite despaired of

ever being any better. Six months later he wrote: "After ten weeks of hard and anxious work I am still holding my own. This is such a joy to me that I am preaching this new treatment wherever I go. After the little confusion which the glasses caused—the perspective of everything being altered—I began to improve in health, and for six months have never had any setback. Refreshing sleep became habitual after a long period of insomnia, during which I was quite a wreck, and with sleep strength began to return, and life, which had been a burden, is now a delight."

The next case—J. M., married, æt. 53, consulted me in August, 1902. He had suffered much in the same way as the last, occasional severe headaches, great mental depression and insomnia. He had been obliged to give up his occupation (a ship-builder), and had been treated by twelve different medical men before consulting the one who sent him to me. He did not then believe that glasses could be of any use, but consented to wear them. Having no faith in them, he consulted two nerve specialists, one of whom prescribed the common remedy, a prolonged stay in Switzerland. His letter, received on January 2, 1905, shows that he has grasped the very point which I wish you to more fully recognize. He writes "that his health is vastly improved since first consulting me; that, after taking to glasses, he had, as the result of consulting two nerve specialists, carried out a treat-

ment—prolonged stay in Switzerland—which had not been previously tried; this his first long journey after taking to glasses was accomplished without a headache (although worn and tired in other respects), a thing which had not happened for many years, and showing that he was getting benefit; that he is fully of opinion that had he not worn glasses the treatment would not have had such good and permanent effect.” These two cases suggest that, however helpful the change of air and scene may be in these cases, they are not enough by themselves to cure if there be a slight uncorrected error of refraction in the background; but first correct this, and the combination will effect the cure.

In my experience error of refraction is almost invariably present in neurasthenia, and I do not mean the infinitesimal amount which physiologists tell us is present in all eyes, but an appreciable quantity such as can be detected and corrected by glasses, a quarter of a dioptré upwards. I have often wondered how it was that this association had not been observed; or, if so, that greater importance had not been attached to it. One reason now occurs to me. Having read a long and able article on neurasthenia in the *Journal*, I was struck by the fact that refractive errors were not mentioned, and asked the author what his experience had been in this direction. He told me that the cases he sent to the ophthalmic surgeon were nearly always returned as “normal, or practically so.” The last two

words, "practically so," suggest a great deal. The ophthalmic surgeon—and I speak generally, not of individuals—finds the patient can see $\frac{5}{8}$ with each eye, and can read J1 without difficulty, and makes no complaint of aching or of trouble of any kind connected with the eyes; even headaches may not be a symptom. He not having had a large experience as a physician, or knowing much of neurasthenia, is satisfied with the patient from a visual point of view, and reports "normal, or practically so." He may or may not have observed slight astigmatism; but if so, why saddle a patient with spectacles under such conditions?

It is necessary that both the physician and the oculist should understand the principle which I suggest to you if good is to result.

The following is a case in point:—A physician in a neighboring town suspected the presence of astigmatism in a boy of 14 suffering from nerve troubles, and sent him to an ophthalmic surgeon, but the report came back as "normal." Not being satisfied, the physician asked me to examine the boy, and I found a quarter of a dioptré of hypermetropic astigmatism in each eye, axis oblique, and ordered glasses to be worn constantly. The boy got quite well and kept so for twelve months, when the mother brought him to me again, saying the symptoms had suddenly all come back again. As the result of a fall one of the lenses had dropped out of his spectacles and had been replaced, but with

the axis in the opposite direction to that prescribed. Some of you have said that my results are due to suggestion and how well this case would have fitted in with that view but for that little accident. One cannot, of course, say what this boy's future might be if the astigmatism were uncorrected, but it is quite possible that it might be not unlike that of a patient whom I saw in August last, whose error of refraction was very similar. This patient described his experience in somewhat emphatic language in a letter four months after his visit to me. He says: "Personally, I can say that life has been much more enjoyable since I visited you. Previously I was intensely irritable and frequently 'cursed myself in my despair.' Latterly I have arrived home from business with a slight surplus of energy and power of concentration which previously was a rare thing for me to do. I have changed my residence frequently, fled to poultry farming once, and generally behaved in a manner which caused my friends to have serious doubts regarding the stability of my mental gear. I now begin to appreciate Carlyle on 'Permanency,' and can form a plan of life where previously chaos reigned. It is impossible, of course, to say or conceive what might have been, but my own personal conviction is that I should have been less of an ass if my eyes had not troubled me so persistently. My internal and secret profanity must have at times satiated the devil himself, assuming such a

personage to still exist. I sincerely hope that this happier frame of mind will become chronic, and that you may long be spared to alleviate the suffering which can only be understood by those who have had to endure it for years as I have done. I have endeavored to represent to you as nearly as possible my actual feelings on this subject, and trust you will excuse my departure from conventional expressions in my effort to truthfully convey my ideas."

One meets with constant variety in the cases sent to one as neurasthenia, and it is sometimes very difficult to tell how much is due to functional disturbances, and whether there may not be some organic lesion present.

A patient was sent to me in May of last year, in whom no organic lesion had been detected, although she had been seen by several medical men, and yet that patient died in the following November, and the autopsy revealed chronic Bright's disease. This patient derived very great benefit from the use of glasses in the relief of her neurasthenic symptoms, and the case is instructive in that it shows how necessary it is to bear in mind the possibility of refractive error being present as a complication in cases of organic disease. Had the Bright's disease been recognized, her neurasthenic symptoms would, no doubt, have been attributed to that, and the patient would not have been sent to me.

Especially would I suggest this point to you in con-

nection with gout, for when once that word has been used there is a great disposition both on the part of doctors and patients to attribute all symptoms to that special cause, and but for this complication being overlooked, many cases of headaches, insomnia, etc., might be speedily relieved.

Perhaps it more frequently happens that serious brain or other lesions are supposed to exist, in which the results show that the troubles are entirely functional. The following is an illustration: J. S., æt. 44, had suffered for some years from nervousness, dizziness and headaches, and for the last six months had been obliged to give up his occupation. From the severity of his symptoms generally, his medical attendant wrote that he feared some serious brain trouble. The doctor who saw the case here asked me to examine him, and I prescribed glasses for constant use. The medical attendant at home was at first somewhat annoyed, as he had already sent the patient to an oculist, who had found slight astigmatism, but had considered it so slight as to be of no special importance. The patient got rapidly better, returned to his occupation, and has since been to Harrogate for a holiday, but feels that he does not now require any treatment. This case shows how dangerous it is to ignore slight errors of refraction, and how misleading it may be to the physician.

It is always interesting to watch the effects of treat-

ment in cases in which the conditions are similar, and in that respect the three following instances are of use:

In the spring of 1903 three patients came under observation, all married, all about the same age, similar conditions of life, one being a solicitor, one a doctor, and one a manufacturer, with similar symptoms, headaches, irritability, depression and feeling unfit to continue the ordinary duties of daily life. They had all tried the usual remedies advocated in these cases, special attention having been paid to the functions of the liver. In spite of treatment they had all arrived at that stage in which something must be done, as they could not go on as they were. In all three cases a sea voyage had been prescribed. In all the cases the vision was quite good and there was no complaint of any kind directly connected with the eyes. The doctor came to see me and I ordered glasses for slight astigmatism to be worn constantly, and he started for a voyage. The solicitor also went by the same ship, but knew nothing of his fellow passenger, and he did not consult me before leaving. The manufacturer, after hearing my opinion of his case, decided not to take the voyage, but returned to his duties. The doctor tells me that the long rest and change of the voyage undoubtedly did him a great deal of good, and he also noticed that he could read in the train without headache since wearing the glasses, which he could not do previously. I, too, have observed that although the

glasses are not in any way a necessity from a visual point of view, he is now never seen without them; in fact, on three occasions he tells me that he has got into bed with them on. The manufacturer has taken no voyage, but steadily improved in health, and in six weeks reported himself as much better. The improvement continued, and I saw him recently in his usual good health and enjoying life again as of old. He was rather indignant at being sent to me, as he had been told previously that his eyes were normal, but he tells me he now wears his glasses constantly and has done so ever since I first saw him. The solicitor returned from the voyage greatly disappointed, as he was little, if any, better. A few weeks later, being as bad as ever, he consulted me, and I prescribed glasses for constant use. In a letter received six months later his wife writes: "My husband is now very well indeed," the "very well" being underlined.

It is my lot to frequently see instances in which the whole career of an individual has been blighted and changed as the result of a cause which might have been easily remedied had it been detected and its importance recognized. This nearly happened to the writer of the following letter, who was considering the question of giving up his post, when he was advised to consult me. This advice was a surprise to him, as he had always attributed his symptoms to digestive disturbances, and had had no discomfort in the eyes, and was not con-

scious of any defect. He wrote me four months after his visit as follows: "I must tell you of the great benefit I have received from the constant use of the glasses you prescribed for me on July 1st last (1903). I had suffered from headaches for many years, the pain being chiefly frontal, and at times so acute that the whole of my head felt as though it had been burnt. About three years ago I was subjected to a very peculiar attack, a sudden dizziness overtook me when just awaking from sleep and I fell into an unconscious condition which lasted for about fifteen minutes. On recovering I was left with one of those violent headaches. These attacks I suffered from repeatedly, and when up and about it required a very great effort to prevent oneself from becoming unconscious. I saw a London specialist, who advised the use of bromides, but with no definite result. Towards the end of June last Dr. ——— advised me to consult you, and I have worn the glasses ordered ever since. About ten days after this I had another of those attacks, perhaps the most violent I have had, this occurring early in the afternoon. Previous to this attack I had occasionally discarded my glasses, but since then I am never without them. Four months have now elapsed and, so far as these attacks are concerned, there seems no probability of their return. Before my visit to you lapses of memory were almost a daily occurrence; now they are practically unknown, and when in evidence are but

momentary. The periods of dizziness have quite disappeared. I feel better in health, my brain is clearer, the headaches have never returned since I wore the glasses, and the state of depression into which I was sinking has entirely passed away."

Were I to assert that error of refraction is responsible for a large proportion of the suicides occurring daily, and that it is a potent factor as a cause of insanity, that assertion would probably be held up to ridicule and dismissed as absurd. Many things appear at first sight improbable, but on reflection much less so, and I will ask you to reflect for a few minutes on this subject. When you have seen, as I have done in a very large number of cases, the effect of uncorrected errors of refraction on the nervous system, you will be struck by the great frequency of the occurrence of such symptoms as insomnia, great irritability, extreme depression, impaired memory, difficulty of concentration of thought, lack of self-confidence, apprehension, weariness and exhaustion, and a general want of stability of the nervous system. I have tried to illustrate error of refraction as the cause, and the correction of it the cure for these troubles. How often the patients have told me they have been on the verge of suicide, and have used the expression that they were afraid they were going out of their minds. It is quite conceivable that suicide would be more likely to occur in those who had been for a long time enduring the

mental torture which results from the conditions I have enumerated and which has rendered life a burden. I will read one or two extracts from actual reports of suicide.

"The deceased had been very low-spirited and had been under medical treatment for six months; she complained of pains in the head."

Another case: "The deceased had been afflicted with nervous debility about four years."

Again: "The deceased had suffered latterly from insomnia, and had been much depressed."

Again: "The deceased had suffered from influenza, later insomnia, and had been taking narcotics to induce sleep."

If alongside of these extracts you read some of the cases I have already quoted, or the following letter, it certainly provides suggestive material for consideration.

The writer says: "I must tell you how grateful I am for what you have done for me. I should have written long ago, but wished to give the glasses a thorough test, and to see if the attacks of terrible depression returned which I have suffered from previous to seeing you. I am glad now to tell you I find the glasses a great comfort, and have never once had a return of those particular attacks of depression which had hitherto made life a misery to me."

Many of you will be able to recall instances of suf-

ferers such as I have described flying to narcotics or alcohol for temporary relief from their distress, and no doubt this leads to much of the secret drinking which prevails to so great an extent. In view of the large number of suicides attributed to alcoholic excess, ought we not to look upon intemperance as a disease, and always try to find out the circumstances attendant upon its commencement as to whether or not it might be due to a remediable cause? We should often be able to trace it to conditions of suffering such as I have described, and on examining the patient, the presence or absence of error of refraction would be a most important point.

Errors of refraction are largely on the increase, and for two reasons—firstly, as a result of the great demands made upon very young children by the educational system of the present day, and secondly, from the fact that they are hereditary. Insanity is also largely on the increase, not only numerically, but proportionately. May there not be a connecting link between these two facts? Much that I have said in regard to suicide might also be applied to the question of insanity. To those of you who have had much experience of cases similar to those I have represented, it would not, I think, require a great stretch of the imagination to suppose that some of them might lose their mental balance and become insane or gradually drift into a condition of melancholia. Insanity is

sometimes attributed to shock, but it would be an alarming thought to feel that any one of us, if exposed to a severe shock, might suddenly become insane. We could more readily understand such an effect being produced in one who has been a long sufferer from neurasthenia, and this reminds me of a case sent to me for neurasthenia. The doctor told me she had on two occasions been out of her mind, the cause being attributed to shock at the loss of her sister, who had suddenly disappeared when on board ship and had not been seen since. This patient had for a long time suffered from neurasthenic symptoms, and had always been of a highly-strung nervous temperament. She had slight astigmatism in both eyes, but of different degree. She had previously been sent to two eminent ophthalmic surgeons, but they had, apparently, not attached sufficient importance to the refractive error to insist upon its constant correction. Again, what a very important position is always assigned to alcohol in the list of causes of insanity. If alcohol by itself were the cause of insanity, we should expect even a larger number of cases to result, seeing the vast extent of its use and abuse, and also more frequent and more rapid cure on its complete withdrawal. In a typhoid epidemic you would not be content to trace the cause to the milk only, but would pursue your investigations to the source of contamination. Would it not be more reasonable in this case also to investigate the condition

of the nervous system which led up to the excessive use of alcohol? and this would often take us back to that starting point which would suggest a very careful examination of the patient's eyes. The truly distressing condition of some of these neurasthenic cases suggests strongly to my mind that as there so frequently is a complete nervous breakdown, so, if unrelieved, there might be eventually a mental breakdown. I cannot help thinking that a thorough investigation of the previous history and a very careful examination of the refraction would result in some of the forms of insanity being traced back to these early manifestations of nerve troubles which have been shown to be due to eyestrain.

We have heard lately of pre-cancerous conditions, and my suggestion is that we have also a premonitory stage in some of the forms of mental breakdown, and that it is during this stage that so much might be done to avert disaster.

The following is a suggestive and instructive case in regard to this point: Mrs. C., æt. 36. Extremely neurotic, had suffered intensely in her head for some years, especially the last four years. Not so much actual pain, but distressing sensations and a constant dread of going out of her mind. Great depression and nervousness and could not be prevailed upon to go out by herself. Could not go to a theatre without much suffering after it, and, in fact, was practically debarred from all social functions, and quite unfit to

attend to domestic duties. She had been variously and greatly treated, had changed her place of abode several times, had had a course of Weir Mitchell treatment; she had consulted five different medical men in Harrogate, a consultant in Leeds and nearly all the doctors in Scarborough. She could see quite well without glasses, but promised to wear them, as she would do anything to get better. She persevered and very gradually, but very surely, improvement took place. In eighteen months after I first saw her she was much better in every way, came over from Scarborough unattended by her husband; could go to theatres and attend to domestic matters, and life was now to her worth living. I have recently had a further report from her husband, who writes: "When my wife first called upon you she was in such a state of nervous prostration that she was totally unfit to perform or go through the ordinary duties of life, and I feel confident that the wearing of spectacles enabled her to battle against her feelings and saved her from a mental breakdown. For the past two years she has never been without her glasses and now her health is nearly restored. May she now leave off the glasses out of doors?"

This was a very long-standing and severe case, and some months elapsed before very marked improvement was observed. Bearing in mind her condition when I first saw her, I can only endorse the opinion expressed in her husband's letter.

I would suggest that in all cases of neurasthenia in which error of refraction is present, it should become the routine practice to have that error corrected. If this be skilfully done and the correction perseveringly worn by the patient, I am quite convinced that those measures which may be prescribed by the physician for the restoration of nerve tone will be not only more rapidly successful, but more permanently so.

I must ask you to receive these remarks as far as possible with an open mind, not with the idea of criticising my feeble attempts at the elucidation of such intricate and difficult problems, but rather to try to find in them some hints, some suggestions to help you in your efforts to throw more light upon these obscure subjects.

THE HISTORY AND ETIOLOGY
OF "MIGRAINE."

CHAPTER VI.

THE HISTORY AND ETIOLOGY OF "MIGRAINE."¹

THE word *migraine* (*megrim*, *the megrims*, etc.) is the vulgarization of a misnaming and meaningless term for a malobserved and trivial symptom, which in the majority of cases is not present, of a widely prevalent and ingravescent disease with indescribable symptoms which wrecks life and morbidizes the mind, the etiology and pathology of which are unknown, the location or organs affected being also unknown, and of which no treatment avails.

The term is a corruption of the Greek *ἡμικρανία* and the Latin, *Hemicranion* or *Hemicrania*, taken to mean a pain in one side of the head. The word is, of course, an absurdity, because it denotes not pain, but only half-headedness, the idea of pain having no part in the construction of the word. One may perhaps speculate in vain as to the reasons of the Greeks for making half-headedness a synonym of pain in or on one side of the head. The fact itself seems to imply that when the word was born there must have been many patients who were so greatly tormented with this unilateral pain of the head that it was at once understood when such a

¹ From the *Journal of the American Medical Association*, January 16 and 23, 1904.

patient was spoken of as "half-header"—"the man (or, more probably, woman) with half a head." The term was used in this way by Hippocrates, Galen and other Greek physicians with the same indiscrimination to express all headache, until Alexander Trallianus in the sixth century recognized that there were two forms of headache, and he urged that hemicrania or migraine was that which resulted from gastric disease or suffering.

In the seventeenth century the kinds of headache began to multiply and they have continued to do so until now they are almost innumerable. The more cool-headed, at least not half-headed, English of one or two hundred years ago, began to recognize that "half-head" did not imply pain, and that pains in the head were by no means one-sided. Migraine, they saw, was not etymologically a pain and the pain that existed in patients was not migrainous. Thence began the use of the good old English word *head-ach*. In his excellent dictionary published in 1809, Parr refers migraine or megrim to *cephalalgia*, and treats of the whole subject of headache, migrainous or not, under this heading. It was a sensible thing to do. It followed that the headache accompanied by gastric disorder, nausea, vomiting, indigestion, etc., naturally and rightly received the name *sickhead-ach*, or as we now say, *sick-headache*. With so-called "scientific" medicine (which in so far as pertains to this disease is absolutely as unscientific as was that of classic or medieval times) there was a

relapse to the absurd term migraine, and under that caption are now published hundreds of erudite monographs that throw little or no light of knowledge on the ludicrous tangle. The word is now applied to a symptom-complex of infinite variability to indicate a very common and violent disease, the cause of which is wholly unknown and for which there is no cure.

The old term "sun-pain" applied to the disease is of illuminative significance. It was so called because it lasted, in the olden times when the theory was formed, only so long as the sun shone, and ceased with darkness. Now in those times all reading and writing was done by daylight; at night the absence of artificial lights compelled cessation of literary, sewing, and hand-craft occupations. With this ocular rest, as always, came immediate relief of the ocular reflexes called "head-ach" and "megrim."

In literature and in history the disease itself has played a tremendous role, and it is not surprising that writers should have busied themselves with it. To attempt any culling or epitome of the literary allusions to headache would fill volumes. There is hardly an observant author who does not give intimations of the fact that must have been either before his eyes, or in them, or behind them, almost every day in his life. For as a source of pain and suffering, as a molder or destroyer of literature, as well as of lives, headache has been, I doubt not, one of the greatest producers of evil.

In any city, village or community of the civilized world, if one will ask any woman and every second man, he will be told that all know of relatives, friends and even whole families constantly suffering from headache, sick-headache and other eyestrain affections. Willis, an ancient writer, already said of this affection :

"There is none but is sometimes obnoxious, so that it has become a proverb as a sign of a most rare and admirable thing 'that his head did never ake.'"

Other diseases, the plagues, poxes, and punishments of evil and unsanitary living, came and went, but headache always remained with men and women, at least since civilization came to them.

An old English chronicler speaks of one :

"A fervent mygreyn was in the right syde of hurr hedde."

Other references are :

"Heyera hermetis purgeth the hemicran."—*Lloyd, Treas. Health*, 1585.

"Oyle of fystikes healeth the hemicrane and watchynges."—*Ibid.*

"Here hence springs the head-ache . . . which last we call the Hemicrany or Megrim, possessing but the one side of the head."—*Vaughan*, 1600.

"The bones help the Hemicrania."—*Lovell*, 1661.

"Subject to the sickness called Megrim or Hemicrain."—*Blount*, 1656.

The opinion of the writer in that monument of French erudition—Larousse's "Grand Dictionnaire Universel"—is plainly implied in the opening sentence of the article on *Migraine*: "The disease which physi-

cians have baptized with the fine name of Hemicrania, without, for all that, feeling themselves under any obligation to cure it." "The shame of medicine," the writer calls it later.

Méry says that migraine is "a wonderful invention which will last until there are no more women."

Samuel Johnson quotes Bacon's *Natural History*, which says that "in every megrim or vertigo there is an obtenebration joined with a semblance of turning around." Both of these chief symptoms, it should be noted, are visual.

Pope wrote:

"There, screened in shades from day's detested glare,
Spleen sighs forever on her pensive bed,
Pain at her side and megrim at her head."

"The sole thing that brings me relief," still say many patients, "is absolute darkness."

In his "Physiology of Marriage" the Frenchman, Balzac, best fitted to give expression to the national opinion, gives a vivid picture of the disease as illustrated in upper-class families. It is always the wife who is afflicted. He pictures it as the queen of diseases, the most pleasant and at the same time the most terrible weapon which a woman can use against the husband. "I have the migraine" ends all controversy. But while ridiculing the disease as a makeshift of these cunning ones to deceive, Balzac gives an admirable description of the attack, and lets us see that the assumed

disease is certainly an imitation of the real, and perhaps the idea of trickery was read into the real experience by the husbands and the romancer. Her book, he says of the patient, is at her feet; the least noise is unbearable; her voice is weak; she silences her husband and all his reproaches with a look. The doctor is called in; he advises exercise and madam recovers. But she gets her way, good or bad, and beats all plots or plans by means of her migraine—the protector of illicit loves and the confounder of virtuous husbands.

For a thousand years in Greece not even the fathers of medicine noticed that the aches of the head were not unilateral. Alexander of Tralles made one distinction, namely, that the stomach was implicated in some headaches. Even this was forgotten and for another thousand years there was no observation that resulted in distinctions. Then began a luxury of growth in nomenclature which has increased until to-day all that one can say is that “there are as many kinds of migraine as there are heads that suffer.” Even a few years ago Nietzsche had to protest to his scientific physicians that his disease was not migraine, because it was not on one side of his head. The spell or hypnotism of a badly-formed, meaningless word thus continues to-day to dominate observation and facts. And all this despite the truth that so many physicians (being students)—Lepois, Airy, Parry, DuBois-Reymond, Travers, Fothergill, etc.—were sufferers from the disease.

Anthropologists have pretty nearly come to an agreement that prehistoric and savage trephining, so general in all races and times, was probably done for the purpose of relieving headache. The location of the hole made in the savage skull, in order to let out the evil spirit, does not warrant the conclusion that the headache was particularly on one side. It may have been so, but the arrow-makers, basket-weavers, etc., in whom it probably chiefly occurred, were not so discriminating as to point it out to the medicine men. Both probably thought of the living cranium as a more or less hollow organ, such as they found it in their ancient dead. The Greeks, and after them the Romans, and then the medieval nations, thought of the headache as a hemicranous ache, although many patients, and most of them in the crisis of the attack, found the ache as much on one side as the other.

Classification and Etiology.—Sauvages gives ten forms: ocular, dental, sinus, coryzal, hemorrhoidal, hysterical, purulent, insectal, nephralgic and lunatic. The great French Dictionary of Medicine finds it best to limit the varieties to two chief classes, the simple and the constitutional. Many authors recognize (1) the idiopathic, (2) the sympathetic (diseases of the viscera), (3) the symptomatic, *i. e.*, from lesions of the encephalon or its envelopes. In Parr's Dictionary (1809) cephalalgia is divided into:

1. The mild, *i. e.*, cephalalgia.

2. The inveterate, or cephalæa.
3. The one-sided—hemicrania, migraine, etc.
4. In one temple, crotaphos.
5. In the crown, *i. e.*, clavus hystericus.

But he says it may be symptomatic and idiopathic, adding that it is often impossible to ascertain the disease of which it is a symptom, and that in some it is unconnected with any other complaint.

The cause of migraine, if known, would dictate the classification. The fruitlessness and self-contradictions reached by all the classifications that have been devised shows only what is frankly confessed, that none has had the hint of a suspicion of the true etiology. The primitive trephiners of prehistoric and present-day savage times were as sure of their pathology as of their therapeutics. Aretæus described migraine under the name of "heterocrania" and with considerable accuracy—better, in fact, than Galen. Aurelianus finds that women are more subject to it than men. Serapion thought the disease sprang from the digestive organs.

Alexander Traillianus continued the great blunder that has reigned supreme almost to our own day, and still rules many minds, that in the symptom-complex we now call sick-headache the stomach is primarily at fault.

Charles Lepois, 1618, taught that migraine was caused by fermentation of the biliary matter which distended the membranes of the brain. Thus began the

fashion of using those sacred mumbo-jumbo words, "bile," "biliousness," "bilious headache," "liver," etc., which have been of such potent-impotent service in the literary and social history of the last two hundred years.

Wepfer ascribed the disease to stagnation of the exudated blood serum in one half of the head. Theories as metaphysical ruled the minds of Hoffman, Willis, Fordyce and others, who credited the disease to animal spirits. Tissot, in 1813, returned to the gastric theory. Devilliers and Deschamps attribute it to disease of the frontal sinus. No one could for long get far away from the ocular idea or location. Schönlein called the disease cephalic hysteria; its seat in the nerves of the forehead and temple. Romberg called it cerebral neuralgia. Chaussier and Pinel charged the disease to neuritis of the seventh and especially the fifth nerve. Professor Brouillard thought the third nerve was the sinner. Auzias-Turenne thought compression of the trigeminus in the cavernous sinus was the cause. Calmeil said that sick-headache was a double lesion; the flow of blood to the central and to the peripheral system. Piorry held it to be due to an ascending neuralgia, starting from the nerves of the iris and pathologically reflected from the sensitive centers to other organs. Charcot insists on an intimate relation with rheumatism, gout, hemorrhoids, and gravel. Of thirty

women with nodular joint affections, twelve had previously had intense migraine.

The number of primary or secondary causes of the disease that have been noted by physicians' reports is astonishing. In DuBois-Reymond's own case the attacks usually followed fasting or lack of food, and many have alluded to this. On the other hand, scarcely less frequently it is caused by the presence of food. Fothergill, with a hundred others, is sure that diet, "the kind or quantity, or both," is at the root of the mischief. He says that butter is the greatest cause, as "nothing more speedily and effectually gives the sick-headache, and sometimes within a few hours." The next most important articles are "melted butter, fat meats, spices, meat pies, hot buttered toast and malt liquors." English authors generally incline to the "bilious," gastric, or intestinal cause of the disease. Fothergill's philosophy of the disease was that an acid or bitter bile in the empty stomach or duodenum, favored by certain foods, was the cause.

If fasting will not produce the disease, overeating will do it. Hunger and satiety are equally effective. DuBois-Reymond again says his attacks were generally preceded by constipation. Wine, even sacramental wine, the least fragment of burnt pastry, are the great causes testified to by a physician as producing the attacks in himself for thirty years. The role of "biliousness," the "bile," "liver," "stomach," "dyspep-

sia," "disorder of the bowels," etc., is a big one in the great tragicomedy during the last several hundred years. Dr. Parry's own attacks were caused by the state of the stomach, "although they occurred without any feeling of indisposition at the time, either there or elsewhere. They generally *went off* with a movement in the stomach producing eructation." "Anything disagreeing with the stomach"—a hearty meal, meats, lack of meats, and every possible article of diet or lack of it—these *ad infinitum* have filled the accounts of patients and physicians. All of which is, of course, *post hoc* logic.

Perhaps next in emphasis and number of mentions after the digestional cause is the sexual. One physician has devoted a whole treatise to "catamenial megrim." Liveing at once stumbles on the fact that men have monthly attacks as well as women, but that does not deter him nor others from the hypnotism of coincidental and succedant disease viewed as cause. Puberty is a great disposer, but why it is so none can say, and the exceptions to the rule are far more numerous than the hits. The greatest reliance is placed on the supposed fact that the menopause brings cessation of migraine. Here again the inaccurate observation and domination of theory is noticed, because in the majority of cases the attacks increase in severity for ten or more years after the menopause, and in men the menopause

pausal factor is not present and they also suffer up to about sixty.

Cephalgia Spasmodica, the sick-headache, Parr describes in a separate paragraph, but his first sentence is that he considers it separately only out of respect to Fothergill, for "this afflictive malady scarcely differs from the symptomatic headache arising from the stomach."

Loud noises, foul air, smoke, drums, military music, review-days, etc., also, it seems, determine attacks. But especially smelling strong odors, particularly of drugs (turpentine, musk, valerian), even roses and flowers, are also effective. The smell of an autopsy room, of a hospital ward, always caused migraine in a great hospital physician, "one of the most brilliant writers," etc. He missed it but once, and that was when the wards had been watered with chlorinated water!

Meteorology is the great comfort of certain physicians in explaining migraine. In 1903 a great one has sought refuge in it when frightened by the ocular theory. Dr. Lepois was attacked "on every change of the weather." Tissot and Labarraque are sure about atmospheric states, changes of season, or of weather. A large number of Symonds' patients blamed their attacks to weather, or no weather, to thunderstorms, etc. Dr. Airy's attacks were favored by windy weather—several of his family synchronously and unknown to each other. Direction of the wind is another

cause, frequent in Libert's cases. The southwesterly wind is effective at Zurich. Wagner, Nietzsche, and others note the power of Föhn to cause the disease.

Mental excitement, emotion, vexation, distress, fright, passion, sexual emotion, etc., have been noted by Tissot, Symonds and many others as influential causes. "Nursing the mother through a long illness," "prolonged lactation," "poverty," "marriage ten years previously," frequent child-bearing, etc., are mentioned. On the other hand, freedom from the habitual attacks is noted during pregnancy.

Violent exertion, gymnastics, and just as frequently, fatigue, are charged with producing the disease. Lifting heavy weights, sudden effort, straining, running, a hard day's washing, skating, traveling, riding, are among other causes of the disease.

"Prolonged discharges," "prolonged indigestion," "disordered bowels," "impaired general health," "debility," "leucorrhea," are recorded observations. The cart is before the horse often, and often there is no horse or no cart.

"The state of sleep, or rather, perhaps, of waking," also causes the attacks, according to Liveing. One wonders if the neither-waking-or-sleeping state would not also do the same. To wake up from sleep seems to have been a frequent cause, and to be awakened before time. Prolonged watching, resistance to sleep, etc., are also listed.

The thousand causes that have been given remind one of the symptoms of the homeopathists in the "proving" of their drugs. However foolish scientifically they are also pathetic and confessions of impotence in the face of a great mystery.

In Symonds' ninety cases the causes are thus classified:

Emotional disturbance	53
Indiscretions of diet.....	19
Denial of diet as cause.....	62
Action of the bowels.....	12
Denial of this cause.....	54
Fatigue	32
Catamenia (out of 76).....	35
Atmospheric states	48
Thunder	25

Analysis of these figures is at once edifying and mystifying and amusing.

DuBois-Reymond held to the theory of a tetanization of the cervical sympathetic, and the great modern French "Dictionnaire des Sciences Médicales" agrees that this is the best theory.

The bibliography of the subject would occupy a volume. The Index-Catalogue and the Monographs of Liveing, Spitzer, Cornu, and Möbius may be consulted for references. All text-books on general medicine and nervous diseases, of course, add to the literature, without adding any clarification of the subject.

Hooper's Medical Dictionary says migraine "arises

from a state of the stomach," and Parr's Dictionary traces causes to bony fragments, exostoses, tumors, worms in the brain, etc. Parr finally breaks down, however, and in despair says: "Authors have endeavored to distinguish by the particular kinds of pain which of these causes may have produced it, but language fails in describing the different feelings and their variety." One of the reasons for the despair of Parr and of all others is that the whole life of the patient was not observed. The clinic was of the day, not biographic. This disease is one of the whole life.

Airy and Förster think cerebral anemia is the cause. Sarda says: "How many dyspeptics have hemicrania! How many migrainics have no dyspepsia?" Liveing's view is that the disease is of the nature of a nerve storm from the sensory centers, and is related to epilepsy.

As for definitions, one modern one may serve for many: "A complex neuralgia of the nervous centers, of the nerves of sensation and of vasomotor nerves, characterized by direct or reflex modifications of the intellect, of sensibility and of local circulation, also of general circulation and of great functions." Almost all authors emphasize the role of "heredity"—"the unknown god ignorantly worshipped." Osler's summary is "the nature of the disease is unknown."

In a general way all theories may be grouped into four large classes:

1. The cause is central. The authors upholding this view are Liveing, Romberg, Anstie, Leubuscher, Jackson, Gowers, Möbins, and others.

2. The vasomotor system is at fault. The advocating authors according to Spitzer are DuBois-Reymond, Möllendorf, Eulenberg, Mauthner, Siegrist, Oppenheim, Whytt, Latham, Lauder-Brunton, Hammond, Wilks, Pemberton, Peake, Handford, Charcot, Galewski, Féré, Thomayer, Lyon, Antonelli, d'Astros, etc.

3. Toxins are the etiologic factors—held by Galen, Serapion, Brunton, Hecker, Haig, Navarre, Wallace, Claus, Rachford, Steckel, Strümpell, etc.

4. Reflexes are the causes, supported by Tissot, Hack, Schäffer, Schech, Sommerbrodt, Zien, Dobisch, Martin, Seguin, Greenwood, Terrien, etc.

Each one of these may be and are combined with either one, two, or three of the others, until only the most patient of experts can distinguish the divisional distinctions. To all others confusion soon becomes ever worse confounded with each hour's study. When one has become migrainous with attempts even to understand the theories he will agree with Osler and others that the nature of the disease is unknown. "*Autant de tetes, autant de migraines.*"

Prodromal Symptoms.—The typical attack is said to be usually ushered in by pain over, in, behind or above one eye, or in one temple, or by vague symptoms of gastric malaise, anorexia, lassitude, sleeplessness, or,

conversely, on reading or writing, with sleepiness. The prodromes that have been noted are many. With or without the pain in the forehead, eyes or temple (or in all three), scotoma scintillans may precede the attack, and a number of authors and many practitioners still think this is a necessary part or prodrome of "true migraine." (This symptom has itself been called "ophthalmic migraine.") But if this is so, we can then have migraine without unilateralism, without pain and without implication of the digestive organs, for I am sure that close observation of many clinical cases will demonstrate that the majority of attacks of sick-headache are not preceded by scotoma scintillans; and that in fully a half of cases of scotoma this symptom is followed by no headache or other symptom whatever.

I have scrutinized the facts in not less than a thousand private cases of typical sick-headache, and myself and assistant are sure that at least half do not have the prodrome. On the other hand, questioning all patients who have had this symptom, shows that the same proportion do not have any headache following. Until I secured a perfect correction of my own ametropia I had frequent attacks of scotoma scintillans—numbering several hundred in twenty-five years—and I never had a headache in my life. Hippus and hemianopsia are also other ocular prodromes.

"*The Typical Attack.*"—The most common, and es-

pecially the initial symptom, is that supposed to be expressed by the name—a pain in one side of the head. This pain is almost always described as over one eye, in it, or behind it, or in one temple. One after another there are or may be additional symptoms until the whole encephalon becomes unendurably painful and sensitive, and nausea and indescribable wretchedness follows; violent emesis then ensues, lasting for a few minutes, or for days; there is then a sudden clearing, and, in otherwise healthy and strong natures, a quick return to health. The recovery may be slower in the weak or otherwise unhealthy. Despite the fact that the digestive disorder is a late or last and infrequent symptom of the disease the gastric origin is still the favorite theory today. But it must not be forgotten that the testimony of all writers agrees with that of personal clinical experience: the number of atypical cases is many times greater than that of the so-called typical. The so-called typical disease is the severe one, that in which there will be at least the two chief symptoms of headache and nausea. Hence the applicability of the term sick-headache to this condition. But, again, the vast majority of cases of what is evidently the same disease do not reach the extreme of nausea or even of vomiting.

One may with truth say that there is no typical disease. The vast majority of cases have no aura. This pathologic house has no portico or front door. Almost

as many cases have the aura only, without other symptoms. The house, then, consists solely of front door. Parkman and Spencer and others avoided what the writers would call migraine by most careful and deft avoidance of the causes of it, and yet their disease was essentially the same as that of George Eliot and Nietzsche. Hemicrania is often not hemicrania, *i. e.*, it is bilateral instead of unilateral. All pain in the head may be absent and the disease have the same cause as in headache cases. The digestional reflexes are in the great majority of cases entirely absent, or they may be of a hundred types. What shall, therefore, be said of a disease that has no true typical symptoms, which hardly ever has all of those called so, which usually has only one, which may consist solely of a prodrome, or without one of the usually recognized symptoms? It is time that it were reborn, renamed, rechristened and reeducated.

The recognition of the essential morbid condition is further rendered more difficult by the intermixture of an infinite variety of symptoms that often mask or complicate the clinical course, complaints and diagnosis beyond recognition. Thus has been completed the utter chaos which today characterizes the whole subject. There is no agreement among a multitude of theorists; there is the most ridiculous weedy growth of contradictions and inconsequence concerning etiology; and of course there is no therapeutics whatever. Migraine is

the puzzle and the opprobrium of medicine. The conclusion of the article in the greatest medical encyclopedia is: *Autant de tetes autant de migraines*, which translated into scientific language means that the almost unique cause of migraine, astigmatism, etc., differs in each case; the exciting cause, occupation and use at near-range of the eyes, differs no less; the soil, *i. e.*, the nervous and digestive systems, into which this infinitely varying seed falls, are also never alike in two cases. How certain, therefore, must it be that the morbid results are so lawless and seemingly illogical.

The terminal stages of the attacks also illustrate the death-and-life struggle of the organism with the excruciating disease. The one-day, two-day, or three-day vomiting and retching described in the cases of Mrs. Carlyle, Nietzsche, etc., is suggestive. There is sometimes a flow of tears, sometimes abundant secretion of urine, a mucus flux from the nose, lavish sweating of the feet, hands, or half of the face; there may be nose-bleeding or even arterial hemorrhage.

A large clinical experience with migrainous patients shows that their headaches are of an apparently amazing variety of kinds, and seemingly, of causes. An examination of the literature also illustrates the same fact, each of these kinds by one or by others being called or described as migrainous. The mere index or enumeration of these kinds of headache would fill many pages. In the first place there is a long list of head-

aches plainly due to organic and systemic diseases, such as tumor and traumatism of the brain, meningitis, fevers, infectious diseases, etc. These are of course excluded. They are few in number compared to the nonsymptomatic and functional cases, but in many treatises they fill most if not all of the field of vision. Of the functional kinds one may likewise construct a huge list: the nervous sick, periodic, hereditary, constitutional, dietary, hemicranic, menstrual, ocular, nasal, dental, constipational, bilious, indigestional; those from intellectual overwork, physical exhaustion, worry, lack of food, from study, bad light, bad ventilation; from coryza, influenza, rheumatism, uterine disease, pregnancy, hysteria, anemia, diseases of the spinal cord, of syphilis, and so on, and so on. And, finally, there is a very large class that can not be ascribed even to the vaguest and most far-off cause. Any one, two, or dozen of the kinds may be mixed in all proportions in any one case, and only omniscience—not possessed at least by young practitioners—could discern the explanation and dissolve the mystery.

Lastly, the location, character and degree of the ache in, about, on and below the head, in spots, in halves, or of the whole, make confusion worse confounded.

The Eye and Migraine.—For several thousand years the observation has been unconsciously persisted in that the cephalalgia is not a head-pain, but an eye-pain.

Few or none in any definite way noticed that it was produced by near-use of the eyes, and none that the various extensions to other parts and organs, the intensifications of the pain, and the masking under a hundred other protean disguises, were also products of continued and increased eyestrain. But there was never any failure of the necessity to notice the implication of the ocular factor. The most noteworthy after the eye-pain was, of course, scintillating scotoma. The seat of this strange disorder has been placed in every part of the visual apparatus from the retina to the ultimate of the visual center.¹ Piorry's theories of "monophthalmalgia" or "iralgia," or of an affection of peripheral nerves of the eye, was followed by Brewster's thought that the retina is the organ affected. Airy, Förster, and Liveing placed it within the cranium, the latter, with Wollaston, locating it in the thalamus. Mauthner argues against the cortical localization. Dianoux thinks the source is in the optic nerve, the chiasm, the optic tracts or the geniculate bodies. Baralt returned to the retinal theory and Féré defended the cortical localization. Possibly the mixture of phosphene symptoms helped

¹This has been elevated into an independent disease, especially by Galezowski and Féré. Charcot, Airy, Latham, Listing, Förster, Mannhardt, Ruete, etc., have especially commended or emphasized the special treatment of this form of migraine. The results are naturally *nil*.

to create the diversity of opinions. It has also been noticed that the typical fortification spectra is of great variety; that often it is not colored or quivering, etc.; that it does not have any uniformity of location or appearance; and finally that it is often not a positive phenomenon at all, but merely a negative one—"aphose," "anopsia," "vision nulle," etc. There may be a failure to perceive the image in varying degrees, in various parts of the field, and for varying lapses of time. "Blind headaches" the patients speak of in such cases. Spitzér is in error when he says all scotomas are positive, the products of irritation. I have had many patients who, on being narrowly questioned, bear witness to the negativity of the visual difficulties. Neither is it always binocular, as he contends. Theory is abundantly contradicted by observation when he says that "the visual aura of migraine is an irritation-symptom, a binocular homogeneous hemiscotoma." Siegrist contends for the purely negative character of all migrainous scotomas, and believes they are of cortical origin. And such beyond question they are.

But wherever may be the location of these disturbances, they are visual in character. Thus what is recognized as the most frequent aura or initial symptom should have pointed to the visual function as the source of the mischief which it ushers in. In other diseases such a symptom dictates the location of the trephining

of the skull. In migraine it is held as without suggestive value.

Some three hundred years ago Lepois, in beginning the study of medicine, found that he was greatly afflicted with migraine. He endured the attacks for four years and then, as thousands have done since, he fled to Italy. With cessation of study and with the out-of-door life he led, he soon recovered, and thought himself rid of the disease. But when he went back to his home and literary work the attacks returned as bad as ever. He naturally sought an explanation of the mysterious affection and found it to consist of a serous exudation produced by vomiting. Since his day the same persistent cause has inevitably produced the infinitely multiplied result, but to the fact all have been blind and all have multiplied theories as misleading and groundless as that of Lepois. And yet medicine is said to be purely empiric. The cause has been ever before and in their eyes and empiricism has failed. And yet medicine is said to be a science, although none has observed the simple fact always present that near-use of astigmatic eyes is absolutely required to produce migraine. In the last century arose a so-called "cure" for migraine or for suffering eyes, atropin in the eyes, when, rarely, the eyes happened to suffer in migrainous attacks. Nietzsche was put through this cure. It acted as successfully as the other prescriptions, "Italy," or "Switzerland," or

“walking the moors.” But the cure did not last. The patient’s ills returned when the mydriatic or the “change of climate” had ended and there was return to literary work. Later, Brewster reports three cases of cure that really cured. He credits it to atropin, but ends the reports of each case with the incidental remark that glasses correcting the ametropia were also prescribed!

Migraine or hemicrania, when we inquire with accuracy either of the literature or of private patients, is almost always not cranial in any common acceptance of the term, but is ocular. The fact that gave origin to the word is that not the skull, so much as the eyebrow, temple, eye, and orbit, is the small portion where begins the headache, and whence with ingravescence, radiates or extends the disease to all parts of the head, with nervous and digestive symptoms. A large proportion of all so-called and recognized “ocular headaches” perhaps have the same initial symptom and location. A great theory of the nature of the disease, migraine, was that of Piorry, which supposed that the neuralgia started from the nerves of the iris and was pathologically reflected from the cerebral sensitive center to other organs, from which reflex came all the symptoms and results of the subsequent disease. When the time and the state of medical science are considered, this showed a remarkably close observation and a near guess at the truth.

Other references to the eyes are "anxiety about college examinations," "troublesome letter writing," "a rapid succession of visual impressions (in traveling) in upsetting the sensorium and producing a vertiginous state allied to sea-sickness." Glaring lights, "sight-seeing," "an evening entertainment" have, of course, been noted. "Reading on a full stomach" caused the attacks in a great physician, and he could thus produce an attack instantly. Two young ladies always brought on the attacks by reading late at night. Incidence of strong light, a reflected light from snow, ice, a tablecloth, are also put as causes. In Dr. Airy's case the attacks generally came on "while the eyes are engaged with troublesome reading." It was so with Dr. Piorry, who could produce the disease experimentally "by strongly fixing the sight on reading." Looking at striped wall-paper, or a striped dress, a trellis, etc., are other causes, but it aroused no attention to astigmatism or the eyes in the physicians who chronicle the fact. Liveing's comments on these causes of the "nerve-storm" and the "habit" of migraine are most instructive—at least for us to-day. Pity they were not more so to him. Liveing notes that dress-makers and others compelled to work far into the night, often for weeks together, complain of migraine. He does not fail to explain it by the "close and confined rooms."

It is set down that "mental exertion"—it is not called study—especially in lads at school and young men at college often causes the first development, or at least the increase, of the malady. "Close application to books," "and those modern instruments of torture, competitive examinations," are emphasized—"especially if coupled with deficiency of out-door life." "The same thing," says Liveing, "happens in later years to literary and professional men," especially between 30 and 40 years of age. But "overwork and over-anxiety in business" are in these cases the causes. "Students' life and intellectual competition," not eyes, are the supposed factors. "In Mr. A's son the early strain of school life caused the 'day-nightmare,' which preceded his megrim, and his subsequent attacks of the latter complaint were always multiplied by close application and almost ceased with an out-door life. It was much the same, though commencing at a somewhat later period, with his father and uncle." DuBois-Reymond found his own attacks subsided when he had leisure to stop severe intellectual work. In one of Liveing's cases, "a child of nine had been overworking at school, and on returning home early with a headache, etc." Another boy was thirteen or fourteen, and to overapplication at school was ascribed his attacks. Of thousands of boys the same might now be chronicled.

But among many other things pertaining to the eye the most striking and convincing demonstration of the ocular cause of migraine, and at the same time one of the most remarkable instances of scientific error, is that of Dr. Alexander Spitzer. In 1901 he published a most erudite and critical monograph on the disease, the conclusion of which is that stenosis of the foramen of Munro is its unique and universal pathologic basis! This bizarre theory, the latest result of critical science, does not need a word to demonstrate its absurdity. One can only ask, why the inveterate disinclination to ignore the eye itself?

In his great work, Allbutt, like many others, notes that migraine is of exceptional frequency among those pursuing sedentary or in-door occupations, and rarely in those living an out-of-door life. The treatment is, therefore, advised to live much out of doors. But Allbutt and his departmental writer, Mackenzie, has no allusion whatever to eyes in the article.

In 1888 Dr. G. Martin (*Ann. d'oc.*, 1888, xcix, pp. 24 and 205), a French oculist, published an article which some time will be recognized as truly epoch-making. But two writers, so far as I have noticed, have even mentioned Martin's magnificent and daring attempt to bring the medical world to its senses. One of these, Spitzer, passes Martin by with a one-word mention of his name. The second, Schmidt-Rimpler,

himself also an oculist, scorns Martin's theory with genuine unscience.¹

One day Martin happened to get one of the astigmatic lenses of his own spectacles reversed, or "hind-side-before," as patients often do, and he had a violent attack of sick-headache. This has frequently occurred with my patients, with the same sudden appearance of "the disease whose nature is unknown." Martin happened to possess the power of observation and to be a scientific scientist. From his own experience he was led to study that of his patients, and it was soon evident that their migraines were due to astigmatism, *i. e.*, to partial and too continuous contraction of the ciliary muscle. When a single eye was astigmatic, and the other not so or less so, the pain (hemicrania) was over the astigmatic eye. With loss of one eye the bilateral migraine (if one may be excused the absurd term) became unilateral. When only one eye is used in vision, if it is the less astigmatic, the migraine is on that side. With cataract operations on both eyes the whole migrainous troubles disappear instantly, because there was then no function or malfunction of the ciliary muscle. (Surgeons and scientists should not,

¹This distinguished specialist rightly finds "glasses do not cure," because he fails to see that he has never prescribed proper glasses for his patients. The astigmatism, ametropia, etc., must be corrected in order to cure, and such correction is beneath the dignity of the German oculists. Patients so report and books and articles frankly confess the fact.

therefore, advise extraction!) Martin reports many cases of cure by spectacles correcting the ametropia. As to heredity, he counters capitally that the corneal abnormality (astigmatism) is as often hereditary as the incriminating diathesis. Of course, a headache can not be inherited, but only the anatomic, or other conditioning, cause of headache.¹ The diathesis or constitutional factor determines whether existing astigmatism will produce migraine, and just what its nature will be. Martin reports 352 cases. Low astigmatisms, of course, are the rule—just such as the inattentive European oculist frankly ignores and scorns. There were, for example, in one series: 66 cases with 0.25 D.; 121 cases with 0.50 D.; 77 cases with 0.75 D.; 18 cases with 1.00 D.; 2 cases with 1.25 D.; 1 case with 1.50 D.

In higher degrees, as we know, there is no attempt to neutralize the corneal asymmetry and so no reflex disease. Near-work occupation is renounced, study interdicted, the eyes ruined, or a criminal life confirmed, but there is no migraine.

The morbid science which made the profession utterly ignore the testimony of S. Weir Mitchell pub-

¹ "A man bored a hole in a tree and a woodpecker came and lived in it. 'The tree has conceived' said the man, 'and has brought forth a bird.' Next year the woodpecker went away and two flying squirrels lived in the tree. 'What a curious thing,' said the man, 'is heredity.'"

lished thirty years ago, made it overlook Martin's most valuable and scientific contribution. The great mass of medical men smiled and passed on after the manner of the leaders who knew so much and yet who knew so little. But the quiet protests and reports of other oculists began to appear, especially in America, and better still, thousands of patients began to tell thousands of their friends that "glasses cured my sick-headache." The doctors kept on with that wonderful smile, but it is now becoming more concealed and if exposed to public view, more sneery and much more sickly. The professional leaders, the text-book makers, the monograph-writers, especially if of European origin or tradition, have the smile thoroughly out of sight. In fact, they never smiled. Their books know nothing of eyes. In our country the bookmakers, as a concession to popular superstition and in order to be on the safe side and to show they do know about all this sort of thing, make a lofty allusion to the ocular factor and treatment, but in a given case in their office they would no more think of directing the patient to an oculist than to a corn-doctor. Osler goes so far as to say that many headaches are from eyestrain; that many of these are hemicranial; and that in migraine the eyes should be examined. Tyson barely alludes to eyestrain. Anders also notes it, but in treatment he ignores it. French and Monro say eyestrain is a cause. The "New International Encyclopedia," volume of 1903,

gives eyestrain as one of the causes of migraine, but fails to mention the fact under treatment. At present, all over the United States, there are quiet, almost unknown oculists who are curing thousands of patients of the afflictions described in the fourteen historic instances of the two volumes called "Biographic Clinics." Hardly a week passes that noteworthy testimonies are not printed in medical journals by honorable oculists, that the eyes are a powerful factor in producing sick-headache and various morbid reflexes. Many other oculists do not publicly testify, and are afraid to acknowledge either their belief or the facts privately, for reasons which all consultants and referers of cases well know. There is an old disease called "being between the devil and the deep sea." Thousands of American patients have learned that good refraction cures and prevents sick-headaches and many other miserable diseases. But their official medical advisers derisively smile that old-time, tired, sneering, sickly smile. The young and timid physicians, specialists or generalists—the great mass of the half-convinced or well-frightened—find themselves on a very narrow strip of an island or peninsula. On one side is water, deep, cold and far-reaching; on the other is what the polite little girl in her prayers called "the gentleman from hell."

The Relation to Age, Sex and Occupation.—From of old it has been noticed that migraine rarely appears

before the age of puberty, and that with old age it disappears. But I am sure that it occurs more often in childhood than is supposed. Gowers goes so far as to say that one-third of all cases begin from the fifth to the tenth year. It all depends on the existence of ametropia and the amount of study, reading, etc., carried on. I have had a large number of school children afflicted with the malady in variant and typical forms. One little boy I particularly remember whose astigmatism for years increased about 0.5 D. every few months was each time relieved of his intense vomiting by a change of glasses until the compensation of the higher astigmatism again became impossible. Puberty has nothing to do with the existence of the disease in either girls or boys. In the same way one of the superstitions of the ages appears in physicians' offices, both in patients and physicians, that with the menopause there is a sudden rising or exacerbation of many diseases, chief among which is migraine. The menopause has nothing whatever to do with this, which is wholly due to the increase of the ocular reflexes caused by presbyopia. The blunder should long ago have been manifest to the crudest observation.

There is no causal relation between the sexual history and organs and migraine. The old observation that women are more subject to the disease than men is also explained by the fact that women have always in the past done more near-work with the eyes than

men—sewing, house-life, cooking, weaving, reading, etc. Whenever men pursue such occupations the disease is proportionally as frequent, modified slightly by their greater neurologic and temperamental resisting power.

The books and monographs also speak of the great incidence of the affection among the upper classes, the liberal professions, men and women of letters, etc. As the French say, *La migraine est le mal des beaux esprit*. This means only that such people read and write more than others. I have never heard of a case of sick-headache among farmers, policemen, firemen, soldiers, ranchmen, trainmen, cattle dealers and drivers, sailors, etc. But among seamstresses, typewriters, typesetters, lathe-workers, watchmakers, book-keepers, copyists, sewing-machine girls, weavers, etc., the disease is as common as among students, literary workers, educated people, etc.

An amusing and long-drawn out correspondence and discussion occurred in one of the London papers in November and December, 1903, on "brain-fag." Almost every line showed that "brain-fag" was caused by use of ametropic eyes, not by use of the intellect.

As to periodicity, when the life has been forced into regularity and routine there is sometimes an approach to regularity of rhythm in the attacks. But in another case, and in the same one if ocular rest is secured even for a day, the return of the attack is replaced by health

and happiness. The length of the attack may thus vary from a few hours to almost any number of days. The interim of freedom varies with each patient and with the ocular labor of each patient, from a day or two, to once in a lifetime.

The Gastric Crisis.—Inaccuracy of observation is shown in the descriptions of gastric symptoms by many writers. In the first place there should be a distinction drawn between nausea and vomiting. Many patients will have nausea only, not followed by actual vomiting, and it is the testimony of most patients that this nausea is far more agonizing than vomiting would be—that emesis would bring relief. On the other hand, there is not seldom intense retching without any or but little vomitus. This is worse than either of the other two kinds of sickness. The difficulty of understanding what actually takes place in a given case is enhanced by the disinclination, especially in literature, of patients to state that actual vomiting took place. They use euphemisms, “malaise,” “nausea,” “sickness” and many indefinite or misleading terms. One’s doubt is heightened by the difference in different countries and even in one country in the significance of the word “sick” and “sickness.” Many writers state that the gastric complication comes on and ends suddenly, and with the vomiting there is immediate return to the normal state of health. But constant

retching and digestive misery sometimes persists for one, two, and even three days.

Then there is the failure to notice that the nausea and vomiting are but the latest and severest stages of the one disease, brought on by continuous application of the eyes, regardless of the prodromal and cephalgic warnings. Parkman, Huxley, Browning, Spencer, Carlyle, heeded the warnings and avoided the results; Nietzsche, Mrs. Carlyle, Margaret Fuller, George Eliot, and Wagner did not heed, and their lives were tragedies. There is also wanting in reports the recognition of the striking fact that patients with the severe gastric disease, sick-headache, which produces vomiting, indigestion, anorexia and anemia, are able and are irresistibly compelled to walk five, ten, or fifteen miles a day, or take some other form of exercise; and they are able to do it with ease and with the most manifest relief of all symptoms. In what other organic or severe stomachal disease is this possible?

Colds, Rheumatism, and Gout.—In private practice the careful and scrutinizing oculist finds that common colds and influenzas have a strange connection with eyestrain, and the relief of these conditions often follows the wearing of glasses. A misplaced or wrong lens strangely results in "a cold." In the cases studied in "Biographic Clinics" there are many confirmations of the fact. Mrs. Carlyle's "eight influenzas annually" is an instance, and all through the biographies

Of several of these cases colds and influenzas are mysteriously present. It is exactly the same with rheumatism and gout. I have found no accident or cause ascribed for Parkman's life-long arthritis. The accounts of Nietzsche's "rheumatism" and that of the other patients are likewise both mystifying and suggestive. Sir Henry Holland is the great advocate of the theory of the gouty origin of migraine. To excess of uric acid in the system he and many others ascribe the disease. Because migraine as an "independent disease" is in reality due to eyestrain, the only conclusion to be drawn is that eyestrain often causes gout, rheumatism and the "uric acid diathesis." To that conclusion medical science may sometime come.

Pareses, Paralyzes, Anesthesias, etc., are most constant, frequently reported, and remarkably peculiar symptoms, concurrent or resultant, in the history of migraine. The following are the words of some of the reports: "The right arm becomes numb in the paroxysm, and in consequence so useless that she will let things drop from the hand." "Numbness and a sense of tingling (like that in a foot or hand 'asleep,' as we say, and 'pins and needles') commence in the fingers of the right hand and gradually extend up that arm and side, until the throat is reached. The interior of the throat, the tongue, and the lips seems to share in the sensation, which is no longer confined to the right side, but affects these parts bilaterally. The

speech is next implicated." "It is utterly impossible for me to speak." "This disorder of speech is like that of some other highly educated patients." "An arm or a leg of the same side, one time one side and one another, go to sleep." "I feel a tingling as if ants were on them. I have the same feeling in the mouth and tongue, and, further, during this period, I have the greatest difficulty in speaking." Disorders of sensation and touch were present in twenty-one out of sixty cases in one series, sometimes alternating with disorders of sight. A distinguished physician, Travers, describes in his own case the numbness in fingers and tongue, so that touch and taste were muffled, etc. Piorry speaks of "painful thrilling," vibratory in nature, "uselessness of the hands," "transient hemiplegia." The description of Nietzsche's "rheumatism" creeping up the arm, etc., and others may be construed as the explanation of popular and permitted pathology. In private practice I have often noted these disorders of motility and sensation as dependent on eyestrain, and if, as I am convinced, migraine is caused by eyestrain, there can be but one conclusion of the matter. The overlooked little and contemptible cause, just as in daily life, is also the secret of pathology and practical medicine.

Ocular Paralysis.—Transient paralyses and pareses of the ocular muscles are well-recognized effects in migrainous histories. "Of the internal rectus of the

right," "partial of the oblique," ptosis, etc., are explained as inhibitory phenomena. Double vision, of course, is the result of these ocular paralyses.

Psychic Disorders, not alone those naturally resulting from long and intense suffering, but such as temporarily and directly are the immediate consequences of the disease, are frequent in all the literature of migraine. Confusion of intellect, temporary loss of memory, inability to speak, or to speak intelligibly, embarrassment, etc., are frequent expressions. It is noteworthy that these are usually concurrent with anesthetics, paralyses, pareses, etc. "Confused and tumultuous mental and emotional conditions" are the most frequent effects. Hallucination is rare. Professor Lebert's severe seizures began with "incoherence of ideas and difficulty in finding words." "Strange and wandering in his mind," "unable to collect his thoughts," "mind affected," "mentally incapacitated," "whatever he read left no impression," "disorder of ideation," "double consciousness," "the past and present confounded," "feeling silly," "losing their senses," "confusion in the head," "uneasiness," "irritability," "mental incapacity," "sick-giddiness," "vertigo," "determinations of blood to the head," "threatened apoplexy," "tumultuary disorder," etc., are a few of the hundreds of expressions that might be gathered in the literature. The description given by Crichton (Vol. I., p. 237) of the case of Dr. Spalding of Berlin

is most suggestive. When the patient tried to write he was unable either to think or to make sensible sentences. A multitude of excerpts might be gathered from literary history bearing witness to the same mental paralysis. Parkman's "stirred-up head" when he wrote a few minutes told him to stop; Wagner, Nietzsche, and indeed all eyestrain sufferers, had the same or similar disorders.

But the profoundest evil is the dejection and disgust with life that follows persistent use of astigmatic eyes. It is noticed in all the best literature of migraine, ill-humor, petulance, morbid introspection, irritability, proceed to melancholy and pessimism in the extreme cases. "Inexpressible fear" is recorded by Dr. Reynolds; "vague dread," "a sense of apprehension and insecurity," "dread," "apprehension," "something about to happen," "shuddering at the thought of an attack," "horror," are some of many expressions that have been recorded. Sir John Forbes says: "There seems to be some peculiarity in the pain, whatever be its degree, unlike the pains of other parts of the body; and as if it were combined with something of a mental quality. There is a feeling and a fear of impending death and the primary symptoms of corporeal disorder, etc." This intellectual disorder and morbidity of the emotions is painfully evident in many great literary men who suffered from migraine or from eyestrain. In Parkman it was so evident, and yet so under control,

that his friends (not himself) and the greatest physicians believed in his insanity. Wagner was also thought to be insane by physicians who knew nothing of migraine and less of eyestrain. Two of Nietzsche's oculists recognized the ocular origin of his malady, but that did not prevent the terrible tragedy of his paralysis. Even Professor Möbius, in 1903, says that "myopia can not produce migraine"; and this great clinician has not heard of astigmatism, or if he has heard of it, cares nothing for it. And if he cared much for it, he could not, in all Germany, get it corrected in his patients. Wagner resolved to commit suicide many times when driven to desperation by his awful suffering. The effect of this mental torture and gloom in great literary workers is the almost single cause of the "literary pessimism" in an age of rugged vigor, luxury and national expansion.

The lessening of the amount of literary work that would otherwise have been done is exactly in proportion to the severity of the reflexes, or in the skill whereby they are avoided. In private practice one finds whole lives made futile, painful and invalid. Doctors are consulted, travel undertaken, spas visited, hydropathy pursued, quackery multiplied, patent medicines guzzled, narcomania encouraged, alcoholism made chronic. In biography one sees literary labor avoided, made impossible, reduced to an hour or two a day or to a life average of production of a few lines

a day. To avoid this Parkman is compelled to write his own name by means of his gridiron and Nietzsche is paralyzed at 44. Moreover, the literary work done is abnormal in character and is produced "in a white heat," the "nerves ablaze," in "a shivering precipitancy," etc., as Wagner, Nietzsche, Carlyle, and others testify.

Treatment.—The chapters on the treatment of migraine are longer than that famous one concerning snakes in Ireland, but are less convincing and satisfactory. The systematic books and articles give pages of drugs to be tried. The profession at one time settled down to hydropathy and diet, until the amusing and yet warning resultlessness lessened the enthusiasm. And then the quacks took up these scientific methods. How both treated the fourteen sufferers of "Biographic Clinics" may be read in those volumes. The present-day treatment of such patients is as ineffective and scarcely less irrational than in the time of Parr, who advises:

1. Keep the bowels open, *i. e.*, give cathartics, purges, etc.
2. Drain from the head by a perpetual blister on vertex, etc.
3. Emetics. "The tyro, without a suspicion of the difficulty, by the exhibition of an emetic has succeeded."
4. The fetid gums, especially if "joined with aloes."
5. Camphor, nitre.

6. He advises against the too common practice of cutting off the hair, because it is supposed to keep the head warm, and also in order that cold applications may be more conveniently applied. The author himself says that he long had headaches and that they returned frequently after shaving the head, and after he let the hair grow he suffered less in violence, frequency and duration of his paroxysms. (When Parr published his dictionary he was 59 years old!)

7. Bleedings, leeches, cupping-glasses, opening the temporal artery, diet, etc.

8. The suppression of the hemorrhoidal discharge. Parr doesn't believe much in this, but says that "in the whole circle of practical medicine no question is so difficultly explained as the connection of the hemorrhoidal discharge with the general health; or rather the supposed connection as stated by the German physicians. The experience of ages must not be overlooked. The hemorrhoids were considered at a certain period of life as essential to the male as the catamenia to the female."

9. Mental causes, anxiety, etc., are to be lessened.

Sequels of Migraine.—Martin and others have noticed that migraine often ends in a period of herpetism. One is reminded of Wagner's life-long and inexplicable attacks of "erysipelas." Blanching of the hair has been noticed. The disappearance of migraine, says the "Dictionnaire des Sciences Médicales," is often

followed by gout, asthma, hemorrhoids and cutaneous affections. Trousseau says the same of gout. Tissot, Wepfer, Schobelt, Laurent, Percy, etc., cite cases in which migraine disappeared and was at once replaced by an unconquerable diarrhea, to which the original disease was preferred. The relation to hemorrhoids noticed by Parr gives a glimpse into clinical medicine, at least of the middle and later ages, which seems to have been overlooked or outlived in our time.

Use of the Eyes at Near-range is the Cause of Migraine.—I have never had or read of a case of migraine or of sick-headache in which it was not strikingly manifest that near-use of the eyes was the cause of the disease. Fifty pages of quotations from Nietzsche, Wagner, George Eliot, etc., could easily be gathered testifying with complete unanimity and intensity to this fact.¹ The records of private cases show the same thing. In the extreme cases, and especially during the ages from forty to sixty years, this inability to write and read reaches such a height that it is possible only for an hour or two or a few minutes a day, and then only with cries of pain. Letters are replaced by postal cards, near-work with the eyes is renounced,

¹ The cephalalgia of students, says Parr, is often a nervous affection merely. "Whatever be the action of the nervous fibers in intellectual operations its excess is often a cause of pain; though, in many instances, the cephalalgia of students is connected with obstruction of the bowels, and very often with increased determination to the head."

and a trip is taken, wet-packs endured, walking or mountain-climbing begun, etc. To such a degree was this recognized, both by patient and physician, that it became in the last few centuries an established practice to spend most of one's time in "walking the moors," journeys to Switzerland or Italy, trips to the seashore, etc. "A change of climate" became the universal prescription for all "brain-workers" who had symptoms of "brain-fag" or of "migraine." The great vogue of hydropathy arose largely from the suffering that followed near-use of the eyes, and spas, cures, mineral springs, health resorts of a hundred kinds and in a hundred places sprang up largely to meet the demand for ocular rest and the relief of other ills that came with it.¹ The world and the profession ascribed the cures to the stopping of intellectual work, and to the waters, packs, mountains and sunshine. But the ills returned always when the eyes were used. Thousands of other persons used brain and eyes without these ills, that made no difference in faulty observation, and the domination of theory and preconception.

Almost all observers find it impossible to draw any distinction between headache and megrim. What causes one causes the other. What cures one cures the other. As a matter of theory, they draw fine and infinite distinctions between the two, but they are ter-

¹ This cause has been operative, one may believe, in establishing the English custom of country houses and homes.

ribly puzzled, contradictory and self-contradictory when it comes to observation of cases and to treatment.¹ The lighter forms of migraine, the unclassifiable thousand types of headaches and "masked migraine" are, says a late writer, "essentially of the same stock—merely feebly developed forms or the vanishing inheritance of previous generations." To such a pass have the theorists come! Driven by desperation and a sound observational instinct, the excellent Liveing, after excluding certain types, justly and rightly, crowds them all into "one independent affection, constituting a malady *per se*—all varieties of migraine."

Liveing is right in finding the riotous multiplicity of symptoms classed under headache, sick-headache, etc., to be the expression of one independent morbidity or malady *per se*, erroneously called migraine or the megrims. But Liveing, as well as every other writer on the subject (except Martin), missed the open secret. The appalling mystery of thousands of years, especially of the last three hundred, the explanation of the one disease whose cause and nature and cure are unknown, is now clear to all who wish to know, and whose minds

¹ An old astute observer wrote: "It may be doubted whether causes do not sometimes produce pain in the head, which are still less easily traced. . . . On a review of these causes of idiopathic headache we must regret that the source of so few cases is discoverable and that we have scarcely appropriate remedies for any of those which we can ascertain."

are capable of receiving the truth. Migraine, in its so-called typical or in its multitude of atypical forms, is but one of the manifestations and results of eyestrain. Eyestrain produces almost an infinity of morbid results, and migraine, typical or not, is, if not absolutely, almost always, one of the products of the malfunction of astigmatic eyes. Any one can test the theory who wishes. The disease may be caused experimentally (on the skeptics, if they will!) by wrong glasses or by maladjusted right glasses. It may be cured by lenses correcting the astigmatism on which the disease depends.¹ The profession has for many years scorned the truth, until now the patients themselves are fast becoming aware of it without the doctor's advice. For many years to come they will probably have to teach physicians the etiology and therapeutics of their ailment.

¹ Very rarely it is not curable, as in the cases of George Eliot and Lewes, because a life of suffering has killed all reaction even when the cause is extinguished. In the young it is always curable—if the careful and scientific oculist is found.

1. The first part of the document is a list of the names of the persons who were present at the meeting.

THE OPTIC AND OCULAR FAC-
TORS IN THE ETIOLOGY OF
THE SCOLIOSIS OF SCHOOL
CHILDREN.

CHAPTER VII.

THE OPTIC AND OCULAR FACTORS IN THE ETIOLOGY OF THE SCOLIOSIS OF SCHOOL CHILDREN.¹

The Theses in General.—There seems no reason to doubt the accuracy of the statistics of Guillaume, Krug, Hagman, Kallbach, and Scholder, which demonstrate that in five European cities over 25 percent of the school children have lateral curvature of the spine. The fact is astonishing and even appalling. The manifold and indirect production of morbidity is incalculable, and the neglect of this pathogenic factor in preventive and practical medicine is of terrible significance. We give absorbed attention to a score of morbid agencies of vastly less importance than scoliosis. Many of these are doubtless the direct and unrecognized results of the deformity, but of this no question is asked. The terminal diseases seize upon the anemic, morbid, and devitalized scoliotic, and the terminal diseases occupy the minds of the pathologists and hygienists to the entire exclusion of the early, real and hidden cause.

¹ From *American Medicine*, April 8, 1905. Previous papers on this subject were published in *American Medicine* of March 26, 1904, and May 21, 1904.

Many experts admit that malposture, especially in writing, is the principal cause of so-called idiopathic lateral curvature of the spine. School desks and slanted handwriting are constantly emphasized as the chief factors in bringing about the malposture, and all are emphatic in advising an erect posture in writing, reading and study. As to study, when not writing, the contention is just and pertinent and the advice easily and usually followed. But as to writing, their advice, as it is given, is impossible of being carried out, and none has seen the reason of the impossibility, because none has recognized that the writing postures heretofore commended are absolutely interdicted by a peculiarity of the visual function, namely, the necessity of seeing the writing field, *i. e.*, the space about the pen-point, with both eyes, but especially with the right eye. The simple observation has been overlooked that the eyes must see clearly and freely what is being done. The command of George Sand, *écriture droite, sur papier droit, corps droit*, "vertical writing on vertical paper, the body also vertical," is the fitting demand or attitudinizing of the theorist who cannot see that obedience is impossible, and that no child and no theorist ever did actually write in that way.

The entire history of scoliosis investigation, of school hygiene and of vertical and slanted handwriting is dominated by the strange ignoring of the

function chiefly concerned in the mechanisms—*i. e.*, the visual function. All motion and activity of the higher animals in the history of evolution has been dependent upon visual function, the finest, most delicate, most difficult of physiologic functions. Even Spencer was proud of his scorn of optics, of his own wilful ignoring of his eyestrain, proud of his pride in ignoring the source of his own ill-health and that of many others.

An analysis of the optic problem, therefore, explains the malposture of writing, and so far as this malposture is responsible for spinal curvature, so far is this deformity due to ocular function. Orthopedic surgeons have taken the curves of the back as the primary ones, and have sought to explain their origin from the facts presented in this region. I suggest that another, the cervical curve, precedes, and by compensation causes those of the dorsal, lumbar, or dorsolumbar spine. In other words the surgeons have neglected the primary functional and habit curves of the neck, which are caused by morbid writing postures and by eyestrain, and which later induce most of those of the lower spine. The



FIG. 1.—A supposed malposture in writing, often pictured but never practised, because the pupil could not see the pen-point or writing field.

malpostures of writing are caused by the demands of physiologic optics, the necessity that both eyes, and especially the right, shall have as unobstructed a view of the writing field as is possible. According to instructions given the right-handed pupil, this clear view is usually impossible without bending the head to the left. There is also another factor, likewise purely ocular, which accounts for the malposture which engenders curvature of a different kind and in an entirely different way. These are theses, which I think are easily demonstrable.

Age When Spinal Curvature is First Noticed.—

Roth, in tabulating the reports of 1,000 cases in his practice, finds that when first noticed the numbers steadily increased from infancy to the age of 13, the highest number being 107 at 12, 117 at 13, 103 at 14, and then steadily declining. The average was 12.32 for the noticed beginning of the deformity, but 15.65 when the patients came under treatment. Eulenburg's 1,000 cases are listed as follows:

Before the sixth year.....	78
Between the sixth and seventh years.....	216
Between the seventh and tenth years.....	564
Between the tenth and fourteenth years.....	107
After the fourteenth year.....	35

Whitman's figures are of 3,252 patients, 1,299 (39.9 percent) of whom were under 14 years of age, and 1,576 (48.4 percent) between 14 and 21. The reports

of some other specialists are in essential agreement with those quoted. More definite data are found in the report of Scholder,¹ whose figures are as follows:

7th grade, about	8 years,	218,	19 scoliotics =	8.7%
6th " "	9 " "	257, 47	" "	18.1%
5th " "	10 " "	408, 81	" "	19.8%
4th " "	11 " "	404, 110	" "	27.2%
3d " "	12 " "	370, 105	" "	28.3%
2d " "	13 " "	354, 115	" "	32.4%
1st " "	14 " "	304, 94	" "	31. %

Frequency.—As to the percentages among school children, the following are the most trustworthy reports:

Guillaume, Neuchatel, in 731 found	218 = 29%
Krug, Dresden, in 1,418 found	357 = 25%
Hagman, Moscow, in 1,664 found	29%
Kallbach, St. Petersburg, in 2,333 found . . .	26%
Scholder, Lausanne, in 2,314 found . . .	571 = 24.67%

The average is thus about 27 percent. Probably but a small proportion of all scoliotics are ever examined by the orthopedist. The general physician does not examine the back in the vast majority of his patients.

Sex.—The disease is mistakenly said to be more than three times as common among girls, although in cases developing in early childhood, sex seems to exercise little influence. Eulenberg puts the proportion as

¹ *Archiv für Orthopädie*, 1903.

high as 10 girls to 1 boy; Kölliker, 5 to 1; Tubby, 17 boys in 69 cases, although he thinks the number of severe cases greater in boys than girls. In orthopedic institutions, the average of nine tables is 85.8 percent girls, and 14.2 percent boys. A number of reasons for the greater incidence of the disease in girls have been given, but they do not appear to be very convincing ones. One at least wonders how puberty can have much influence. The old *propter ovarium est mulier* idol has to be redressed, solemnly bowed, prayed, and sacrificed to, even in scoliotic deformity.¹ It is evident that the numbers reported by orthopedists are without value, so far as indicating the absolute relativity. Thus, under five years of age, Rédard found the sex numbers equal, and in Dresden among 1,418 school children, Krug found scoliotic boys 181 = 26 percent, and girls 163 = 22.5 percent. In Lausanne, Scholder found among 2,314 pupils of the primary grades, 571 scoliotic, of whom 23 percent were boys and 26.7 percent girls.

Statistics of the Kind of Curves.—The figures reported by the older writers as to numbers of the different kinds of curves are wholly untrustworthy. It is perhaps impossible to explain the errors of these reports satisfactorily. The latest and most accurate observers, in fact, reverse the relative numbers of right and left curves, as given by Roth, Kölliker, Drachmann,

¹ See especially Tubby, p. 108, and also other writers.

Adams and Lonsdale, and the Royal Orthopedic Hospital. The institutional figures differ decidedly from those of school children in the primary grades, and as it is in the school or young children that the begin-



FIG. 2. — Another impossible posture, similar to that of Fig. 1, and unconsciously and unintentionally showing the cervical curve with convexity to the right, which is common in dextral writers.

nings of the evil are found, it is upon these that attention should be exclusively directed. It is the very earliest stages which must be studied, as the later complications are merely the results of compensation.

Of the 571 Lausanne school children examined by Scholder and his assistants, the curves were single left-sided in 401, or 70.3 percent; 121, or 21.1 percent, were right-sided, and 49, or 8.6 percent, were combined. Krug's figures are 67 percent left, 21 percent right, and 12 percent combined. In the report of Schulthess, the proportion of left curves is higher—approximately 90 percent left as against 10 percent right.

Causes of Lateral Curvature.—Many writers, after listing a number of causes, such as inequality of the length of the legs, paralysis, thoracic disease, traumatism, organic disease of the spine, sacroiliac disease, rachitis, occupation, heredity, etc., confess that in the greater number there is no certainty as to etiology. This mystery has taken shape in the designation "idiopathic," which is, of course, a frank confession of lack of knowledge. As to occupation and posture, the "confession" appears in another phasing in Whitman's table:

Occupation.

School	285
No occupation	59
Factory	19
Clerk	13
Domestic, millinery, etc.	24
	400

Posture.

Weight on right foot	48
Weight on left foot	48

Carrying weight on right arm.....	38
Carrying weight on left arm.....	36
Faulty attitude at desk.....	57
Sundry	5
	232

And again in Roth's table of causes :

Hereditary	297 cases
Rapid growth	203 "
Delicate	176 "
After acute fevers	59 "
Lung affections	41 "
Born in the tropics.....	27 "
Nerve diseases	24 "
Education (violin, piano, etc.).....	14 "
Premature birth	11 "
Eye affections	10 "
One of twins.....	8 "
Elderly parents	5 "
Very tall	3 "
Sundry diseases	8 "

Scientifically these awkward gropings after an explanation would be provocative of a very unscientific kind of laughter were it not that the subject and its suggestions are of a profoundly serious and pathetic nature. The most striking physical characteristic of the human animal is his erect posture ; all his dignity is in that and his health ; and there is no misfortune so great and no suffering so poignant, both physically and mentally, as that inseparable from spinal disease. Every consideration, professional and humane thus demands that a solution of the appalling mystery of

spinal curvature shall be sought with all the zeal, ingenuity and knowledge at the command of men of science and benevolence. I believe that it is demon-



FIG 3. — The hand in the writing posture as usually ordered, but not practised, because to the writer the writing-field is hidden by the thumb, finger, and holder. A view of the hand, as seen by the writer, with the head displaced in photographing.

strable that the great majority of so-called cases of "idiopathic" spinal curvature are directly and indi-

rectly the consequences of visual function and chiefly of binocularity, dextrocularity and astigmatism.

Ruprecht holds that ordinary lateral curvature is rachitic and Deutschländer goes so far as to say that all scoliosis begins in bone-disease, and that there is no such a thing as a habit type, all being constitutional. (Sutter's report is of 1,140 institutional children and suggests nothing new as regards etiology.) Such opinions need only to be glanced at and passed with a smile. They illustrate the too common tendency of specialists and particularly of pathologists, to "go to seed," and the seed without any germinating power. Even Scholder's institutional cases were not always rachitic, and of the school children cases up to the fourteenth year, only 21 percent showed any rachitic symptoms. Too often the modern pathologist is apparently wholly oblivious of the axiom of physiology and of pathogenesis that function precedes structure. Liebreich¹ does not make this mistake, saying, *c. g.*, "How these curvatures arise in children, notwithstanding their healthy bone structure, I have first illustrated, etc." As to constitutional diseases, Drachmann found but a small proportion of scoliotics among 28,000 children examined and which were anemic or scrofulous. According to Adams, lateral curvature rarely exists with pulmonary tuberculosis—in marked

¹ *Klin. Monatsbl. f. Augenheilk.*, 1904, and *Annals of Ophth.*, January, 1905.

contradiction of Eulenberg, who found that 25 percent of scoliotics showed a tuberculous tendency, and to Vogt who reported it in half. Lorenz thinks that weakly children have *ipso facto* a disposition to the disease. Lorenz also thinks symptoms of general disturbance accompany the development of the deformity.

As regards all such statements it may be urged that they are rendered valueless by the simple observation that the general or systemic symptoms of eyestrain, such as headache, anemia, anorexia, etc., now recognized by all competent American oculists as frequently due to the eyes, are not recognized as due to astigmatism, etc., by the orthopedists and hygienists, especially of Europe, but are charged to general constitutional diseases, supposedly present. Another similar instance of *post hoc, propter hoc* reasoning is to credit to the constitutional disease the balance of the anemias, weaknesses, etc., which may be due directly to the abnormalism of the curvature and the desperate efforts of the system to overcome or resist it.

It is admitted that all attempts to prove the origin of lateral curvature in supporting the weight of the body have proved in vain; and that the carrying of weights, unless habitually and unsymmetrically, is also of little or no influence.

Resist the Beginnings of Evil.—If it should be established that the functions of vision and of eyestrain are responsible for most spinal curves, the fact will throw

added light on the symptomatology as well as etiology. I shall allude to but one or two aspects and first in a quotation from Tubby:

"For my part I think that if 1,000 presumably normal children were examined, the proportion of them showing some deviation of the spine would be large, but I should not include these as cases of scoliosis, inasmuch as they do not develop rotation.¹ And it is always a serious matter to disturb the domestic peace by pronouncing a child to be afflicted with spinal deformity; rather every effort should be made to minimize than magnify the possibilities of a slight case, both to the parents and in the hearing of the child. A slight spinal deformity is often 'treasure-trove' to a hysteric lad or girl."

Was there ever more unscientific and inhumane advice? How discover the cause when the beginnings are minimized as unimportant? In no type of disease is the advice, *principiis obsta*, more zealously demanded. To lull to inconsideration with the hypnotic of pooh-pooh is surely as bad therapeutics as it is pernicious sociology. Almost all scolioses begin in the slight functional curves. The gravity of such beginnings can hardly be overestimated. There remains also the glaring question, Whence the "hysteria" of these "lads or girls"? Lastly also arises the question why so many of these scoliotic children have headache, poor appetite and digestion, are "nervous," pale, anemic, "delicate," have so many intercurrent dis-

¹ There is *always* an element of twisting or rotation in lateral curvature.

eases, are backward in their classes and all the rest? The answer will be found in the fact that eyestrain, which causes many of the malpostures, also causes a



FIG. 4. — Changes of posture of body and head, the paper skewed, and the penholder angled, in order to bring the writing field into view. In practice different pupils modify or emphasize one or more of the factors, all of which are somewhat exaggerated in the picture.

certain large proportion of these systemic and cerebral disorders.

The Writing Posture.—Almost all authors, in fact, proceed to blame the school desks and the postures in

writing supposedly engendered by them. Thus Roth says :

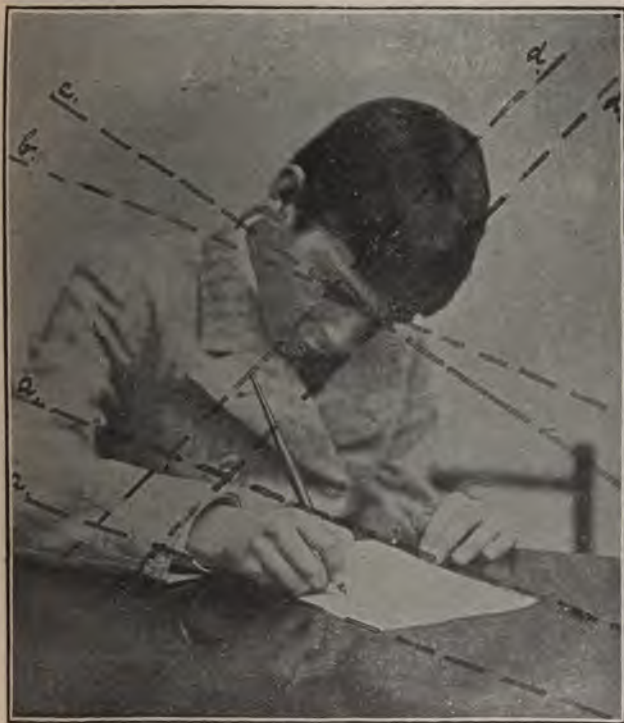


FIG. 5.—The usual malposture of writing. The skewed paper and head and body bent to the left producing a cervical curve with convexity to the right, with inclination and torsion. The astigmatic axes, *d, d*, are at right angles approximately, with *a, a*, the upright lines of the paper and of the letters formed. The inclination or torsion of the head is lessened by slanting the written letters, making variations in approximate parallelism of the lines *c* and *b*, with *a, a*. This is the reason for slanted handwriting.

"The position in writing, as generally practiced, is, more frequently than anything else, an initial cause of most cases of



FIG. 6. — More hygienic posture gained by placing the paper vertically opposite the right shoulder. Some constraint is still necessitated by the level desk or table.

lateral and other curvatures not due to diseased bone or infantile paralysis."

But Roth then goes on to make some highly erroneous statements:



FIG. 7. — Normality of posture by placing the paper vertically, opposite the right shoulder, and with the desk-top well inclined. The pitch here shown is about 45° . At least one of 30° is demanded, although when greater the ink will still flow.

"For many years I have made it a rule, when examining for lateral curvature, to let the patient sit down and write his

or her name, and to observe the posture then assumed; nine times out of ten the patient will have placed himself or herself in a posture corresponding with the form of the curvature, except that usually it is highly exaggerated. In most early cases, where, as we shall see later on, the whole spine is usually convex to the left, this is found to be exactly the posture in writing; in severer (*i. e.*, more advanced) cases, where the usual type is to have the dorsal (upper) curve with convexity to the right, the patient in writing generally raises the right shoulder, and this to a far greater degree than in the ordinary posture of the lateral curvature. This vicious posture during writing is due to the unfortunate custom of teaching a slanting handwriting from left to right upward obliquely, whereas the natural direction of the handwriting ought to be really in the opposite direction, as anyone will recognize by sitting perfectly erect with his hands symmetrically placed upon the desk and then attempting to write without screwing the right hand round or twisting the body. I have therefore been glad to see that in the so-called 'reformed' handwriting children are taught to make the letters vertical, or even sloping the other way."

I am utterly incapable of understanding how such a statement could be made by anyone who had observed any school child, any adult even, or himself indeed, during the act of writing. No right-handed two-eyed person actually writes with the head or body bent to the right, and the spine with the convexity to the left. Such a supposed position is often pictured in books, and I reproduce one as illustrative of the mistakes of this kind (Fig. 1). In such a posture the pen and writing space are more or less hidden from view. Every person so placed at once changes about and cants the head

to the left, the neck presenting a convexity to the right, the body also probably adding other malpostures, such as turning the right side toward the desk, skewing the paper, holding the pen unnaturally, etc. All of



FIG. 8. — The unobstructed view of the writing field gained by the writer in Fig. 7. The head is bent out of sight in photographing.

which is in obedience to the demand, unconscious by the writer, and unobserved by the physician and teacher, that the writing space about the pen-point shall be seen by the right eye. The error of these authors may possibly be explained as arising from their desire

to find the posture of the child in writing such as will explain the dominant type of initial single curves to the left, and coupled with the false supposition that the bending of the body slightly to the right can be the only possible cause of the left scoliotic curve. Unconsciously, however, they may picture the head bent to the left while the body is bent to the right (Fig. 2), and at all events they completely ignore the initial, dominating and supreme etiologic factor, the head bent to the left and forming a right cervical curve. The suggestion I have to make is that this right cervical curve, without exception functionally present in all right-handed writers, is the primary pathogenic factor, and the simple left curve of the spine below is merely secondary and compensatory. The still later compound curve most frequently right dorsal, left lumbar, is the third or compensatory stage following the second single curve.¹

¹The opinion of Tubby also seems to point to a similar finding of the facts in accord with a false theory. He says: That the dorsal convexity to the right is more frequent, admits of no dispute. The statistics quoted by Mr. Adams fully support the generally received opinion; of 569 cases in the dorsal region, 470 were convex to the right, and 99 to the left. As to the reason of the excessive preponderance of right-sided dorsal curves, I believe it is due to excessive use of the right arm in faulty positions involved in occupations and employments, these being such as to elevate the right shoulder and depress the left. Occupations of this nature are, clerking among men, painting and sewing among women, and

The importance of rotation of the vertebrae as a deforming factor has been brought out by Dr. Lovett. Anything which causes a rotation of the spine or head is a powerful influence in causing lateral curvature. "Any lateral yielding of the spine," says Lovett, "at any part must be accompanied by a twist of the spine. As the lateral curve increases, the twist will tend to increase." Dr. Lovett emphasizes that the torsion or rotation of the head alone causes rotation of the spine, and that in all spinal curvature there is rotation. This, he says, may be easily demonstrated by placing the patient in front of the physician, with the back exposed, and have the patient turn the head or shoulders sharply to the right or left. We may therefore accept as true that any cause which compels too continuous abnormal postures of the head will probably produce scoliosis. The cervical vertebrae are part of the spinal column and the mechanism whereby a persistent curvature or rotation of one part of the spine results by compensation in curvature of the other parts, while not perhaps well understood by orthopedic surgeons is still admitted. So far as this paper is concerned, the demonstration of the mechanism must, of in school children the very absurd position they are forced to assume in learning to write the "Italian hand." The desk is often too low, and the child is compelled to stoop over it, with the right arm raised and rigid to insure correct and fine up strokes, while the left arm is depressed, so that the hand may fix the copybook.

course, be left to orthopedic surgeons and the future progress of science. There are possibly some occupations besides writing which may compel these abnormal head postures, but at least in school children they are few and inconsiderable. Among occidental peoples the habitual writing posture is always with the head bent to the left, the cervix presenting a convexity to the right. In addition to this the chest or trunk is commonly more or less bent to the left, and there is also another morbid factor added in the torsion of the head whereby the chin is turned to the right. (In the 1 percent or 2 percent of left-handed the inclinations and torsion are, of course, all reversed.) The reasons for the assumption of this malposture in writing, together with the related questions of vertical and slanted handwriting, unhygienic school-desks, etc., I shall discuss more in detail in another article now written, to be published in the *Medical Record*; and I may here only briefly epitomize the conclusions reached:

1. The school desks and seats, imperfect and unhygienic as they may be, are not the primary or chief factors in the production of the morbid writing postures, and hence do not *per se* cause spinal curvatures.

2. They are not the cause of slant handwriting.

3. The two really important needs in school desks, space to the right so that the paper may be placed opposite the right shoulder or elbow and a pitch of 30° or more have not been suggested or demanded.

4. Hygienists and the advocates of vertical as against slanted handwriting have persistently demanded a position absolutely impossible to be taken by the writing child, and have never seen that the child neither takes such a position when actually writing, nor that he cannot take such a position, nor the reason therefor. Slanted handwriting, so far as the writing child himself is concerned, has no relation, as a cause, to disease, nor to the malposture, but is solely a result of the malposture—is in reality a method of lessening the malposture and of its consequences.

5. With the head and body erect, the paper straight before the median line of the body and the penholder held as commanded, no person can or will write, for the simple reason that the writing and the writing field about the pen-point are hidden by the writing hand, and the penholder (Fig. 3). Immediately the pupil skews the paper, tilts the head to the left, and grasps the holder differently—all in order to bring the writing field and letters being made into clear view, and especially of the right or "dominant" eye (Fig. 4). Beside the bending of the head (and usually also the body) to the left, there is a synchronous rotation or torsion of the head to the right in order to bring the predominant 90° and 180° axes of astigmatism (instinctive desire for verticality and horizontality) into alignment with the upright strokes and lateral lines of the pen and paper (Fig. 5). The cervical vertebrae

are thus forced into a combination of three morbid positions caused by: (1) Bending the head forward; (2) canting it to the left; (3) rotating it so that the chin is turned to the right. There is thus produced a threefold increase of the scoliosis-producing agency



FIG. 9. — Suggested angling of the penholder in order to bring the writing field into view without morbid posture of the body, head, hand, or paper. (Flanges are fixed to the holder—hidden in the cut by the fingers—to insure ease of holding, steadiness, etc.)

which is transmitted to the dorsal and lumbar regions of the spine in the effort at compensation. There is always a tendency to hump-back in patients with lateral curvature.

6. The slanted handwriting is due merely to the fact that less torsion or rotation of the head to the right is rendered necessary and a slight easing is secured by slanting the letters to the right. This is illustrated in Fig. 5. The attempt to make the pupil write vertically, without correcting the malposition demanded in order to see the writing at all is futile and is an unconscious fanaticism preferring 27 percent of scoliotic children to an unesthetic and mildly criticizable slanted handwriting.

7. The cure of the false position and of slanted handwriting consists in: (a) Placing the paper vertically and opposite the right shoulder and upon a desk leaf pitched at an angle of 30° and 12 to 14 inches from the eye, the body normally erect and hygienically posed (Figs. 6, 7, 8). (b) Or by the use of angled penholders as pictured, leaving the paper straight in front of the body (Fig. 9). (c) The grasping the old straight holder between the first and second fingers, or as the Japanese and Chinese do their brushes, from two to three inches from the point, and the upper end held vertically or somewhat slanted to the right. This would require that our common steel pens should be made somewhat differently.

The last two suggestions are, I think, less ideally perfect, are in fact somewhat of the nature of expedients, in the lack of properly constructed desks. Something, anything, must be done to prevent the hor-

rible production of scoliosis in over a fourth of all school children.



FIG. 10. — Picture of patient taken 35 years ago, showing tilting of head, due to astigmatism of a peculiar variety, and producing spinal deformity.

Head Tilting from Astigmatism.—Except in the few left-handed, therefore, the malposture due to the writing act and caused by visual function and peculiarity, results in a tilting of the head to the left and a functional right convex cervical curvature. There is another class of cases, also due to the eyes, which in the large majority affected produces a canting of the head to the right and resulting in a functional left curvature of the cervical portion of the spine. The first class of cases was in large part caused by the need of participation in vision of the right or dominant eye. The second class is also ocular in origin and depends upon astigmatic peculiarity of the dominant eye.

It is perhaps necessary to explain more fully what is meant by the dominant eye; I refer for a more extended statement to "Dextrality and Sinistrality,"¹ and "The Pathologic results of Dextrocularity and Sinistrocularity."² From one of the articles I quote:

"A little observation and a few tests will show that, with few exceptions, the right-handed or dextromanual person is also right-eyed, or dextrocular; and the left-handed is left-eyed. That is to say, there is, in the dextromanual, the same habitual and unconscious choice of the image of the right eye for the more expert and important tasks, just as the right hand is chosen for those functions in skilled work. A dextromanual hunter places his gun against the right shoulder, because he can sight it with the right eye better than the left eye. The right-handed person, in playing the violin, violon-

¹ *Popular Science Monthly*, August, 1904.

² *Ophthalmology*, October, 1904.

cello, etc., is forced to use the left hand for the more expert task, because he thus sees the fingers and the neck of the instrument without fore-shortening and better than he could if the fingering were done with the right hand. All actions, in fact, are determined by the fundamental necessity that accurate vision shall precede all action, and vision is more accurate with the habitually exercised eye, just as manual function is more expert and reliable with the hand most exercised in a special kind of work. But the domination of one eye does not throw the other out of all function, and especially in artistic work where stereoscopic vision is of high importance. Du Maurier had but one eye, and his drawings have a peculiarity explained by this fact.

"A little closer observation soon demonstrates that not only is the dextromanual also dextrocular, but that he is likewise right-footed, and usually right-eared; he is dextropedal and dextraural. This is equivalent to saying that a person is either dextral, generally, as to ear, eye, hand, and foot, or else he is sinistral. There must manifestly be a unity in the coordinations of all acts, and such coordinations would evidently be better with a habitual one-sided similarity of execution running through all kinds of action, so that there would be no indecision in rapid and dangerous acts. The unity and the resultant promptness and accuracy of all motions is thus enhanced by a synchronous dextrality and sinistrality. The mixed type, illustrated by the so-called ambidextrous, would place the organism at a wretched disadvantage in the struggle for existence, and in the social struggle of the highest types of civilized life.

"The underlying and long forerunning cause, however, of the coordination of dextral acts, or of sinistral ones, lies in the necessity of the localization of the organ of speech in one or in the other side of the cerebrum. As it is a single and not a dual function, its organ can be only in one place. Pathology has proved what physiology pointed out, that in the dextral the speech center is in the left side of the brain,

and in the sinistral it is in the right side. Moreover, the intellectual act of writing develops the speech center on the side opposite to the writing hand. The history of cases with tumors and paralyses has settled this question beyond controversy.

"The speech center may be looked on as the organ through which intellectual judgment and decision issues in determination and act. The spoken and written word is the most intimate act of the mind, its irrevocable and immediate exponent. Prior to all judgment and decision, vision must give the data. Intellect is, in fact, the product of vision, and all mental symbols, the letters of the alphabet themselves, are but modified visual images. The thing seen is thus worked into judgment, and by the third component of human action, motion is wrought into completed function. Vision, judgment, act, are thus the unexceptional conditions of human activity and validity. It is at once plain that if the centers which intermediate these three functions are on one side of the brain, in contiguity, and closely united by many intercentral fibers, the resultant act will be more accurate and rapid than if one or two of the centers are in the opposite side of the brain. The commissural fibers between the two cerebral hemispheres would be fewer and longer, and the coordination less clear, sharp, and certain. This is the neurologic basis for a common dextrality or a common sinistrality of function in one individual, and it completely demolishes the foolish contention of those who would vainly educate the two percent of left-handed children to be ambidextrous."¹

¹One thing has been much impressed upon me, and that is that those who are normally left-handed, and are taught to write with their right hand, suffer from writer's cramp much more readily than normally right-handed individuals. It would seem as though nature were taking her revenge for an interference with her original plan, for the man is right-brained and should not be compelled to use his right hand for a work requiring so much coordination as does writing.—From "So-called Rheumatisms," J. J. Walsh, *Medical News*, February 18, 1905.

In a small proportion of the oculist's patients he finds a peculiar asymmetric axis of astigmatism in the dominant eye which compels the child and youth to hold the head inclined or tilted, usually to the right, and *almost all the time*, in order to bring the abnormal axis of astigmatism to 90° . At the worst, school sessions last for but a part of the day, writing for but a part of the school hours, the school term for but a part of the year, the school years for only a part of the youth and adult life. A cause that keeps the head tilted to one side all the waking hours of youth will inevitably result in lateral spinal curvature. Such a cause is a certain axis of astigmatism in the dominant eye not compensated for by that of the other eye.

An axis of astigmatism in the dominant eye from 10° to 20° to either side of 90° or 180° , while the axis in the fellow eye remains normal or unsymmetric, produces head tilting; symmetric axes produce no head tilting. In a year after I discovered this law I found in the ordinary run of office practice over fifty cases of head tilting. The stupid error I made all my life was to allow these patients to cant the head during the refraction testing. In this way I failed to find how large is the number of right-handed patients who have axes of astigmatism of the right eye from 10° to 20° to one side of 90° or 180° . And never before this had I thought of the necessity of inquiring as to dextromanuality in patients having these slightly unsym-

metric axes of astigmatism. It is evident that an axis in the dominant eye only 5° to one side of 90° or 180° would hardly produce a noticeable tilt of the head, or might possibly be compensated for by the rotation of the eyeball itself. It is possible that some types of heterophoria, and especially cyclophoria, may be explained as arising from this compensation of the ocular structures, instead of producing the tilt or cant of the head. It also seems possible that this compensatory twist of the eyeball in the orbit may possibly cause a compensatory twist of the optic nerve, and perhaps certain other diseases of the papilla and retina. After prescription of proper correcting glasses it would be natural to find before long a secondary change of axis resulting from the rectification of the abnormal head tilt or ocular twist. Such patients must be kept under continuous and repeated observation. If the axis of astigmatism of the dominant eye is about 75° or 165° , it is evident that if the nondominant eye is unsymmetric, the head must be tilted to the right in order to bring the false axis into line with the vertical lines of print, trees, houses, wall paper, doors, etc. (Figs. 10, 11). If the axis of astigmatism of the dominant eye is about 105° or 115° , compensatory tilt of the head must be to the left. Greater variations of the axis than 20° would hardly be compensated for by head tilting, but would either produce amblyopia, a transfer of dominancy to the other eye, or else some other path-

ologic consequence equally harmful to action and life. The axis of the largest number of head tilters is about 75° in the right eye, and thus the majority tilt the head to the right.

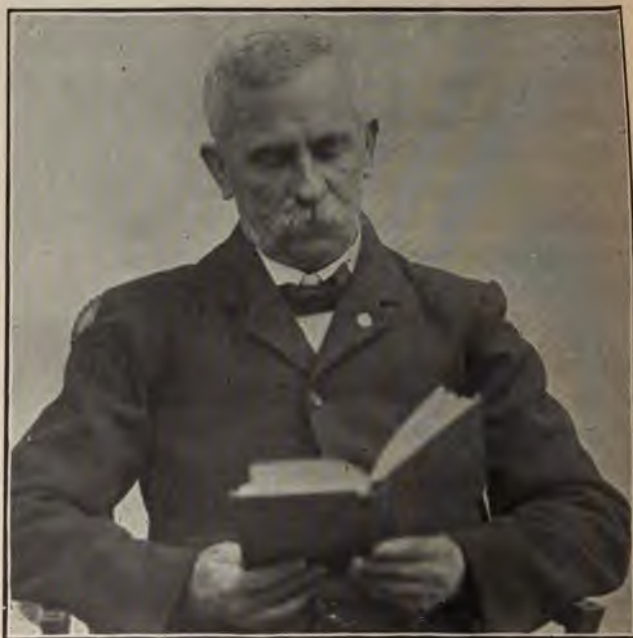


FIG. 11 — Present habitual pose of head of patient shown in Fig. 10.

Among my cases of head tilters the majority had resultant spinal curvature or scoliosis or otherwise malformed backs. The fact was usually unsuspected by

the patient, the parent, and the attending general physician. I sometimes had difficulty in getting consent that an expert orthopedic surgeon should verify the diagnosis. A report of these cases will be published later.

Of course there are other cases of functional head tilting, wry or twisted necks and spasmodic or rigid conditions of the head. A person who has one blind or nearly blind eye, or one deaf ear, will turn the functional eye or ear forward and bring about habitual abnormal head postures with the same disastrous results to the spine.

Other Organic Results of Head Tilting.—In the *Journal of Medical Research* of July, 1904, Dr. Thomas Dwight writes of the anatomic anomalies causing malposition of the head and distortion of the face. These he classes as follows:

1. Diminution of the cervical vertebrae.
2. Fusion of the cervical vertebrae.
3. Union of the atlas and occiput by fusion or by a paramastoid process with or without fusion.

A question as to the origin of some of these anomalies, especially those in which fusions have taken place, is suggested: May they not in part or often be due to the habitual malposture of tilted head or wrenched and rigid attitudes, themselves the products of the postures compelled by astigmatism and other optic defects?

Illumination of the School Room.—Many writers

have ascribed the malposture of pupils in writing to the fact of the wrong direction of the incident illumination upon the desk. However necessary good illumination may be it scarcely influences the posture. Bad light is bad, but not for a bad reason. It is remarkable how indifferent children and indeed almost all others are to the direction of the light. Scholder places insufficient light as the first of the evil school influences which begets scoliosis, by forcing the child to bend forward. To get relief he says unsymmetric postures sideways are assumed and the curvature begins. This begs the question and ascribes to the assumption results which leave the mystery greater, because there will be lateral postures to both sides and neutralization of any tendency to one curvature solely. This wrong explanation of malposture is another instance of grasping at a hoped-for elucidation of the fact deplored, in the absence of an exact recognition of the real cause. Scholder even claims that in the new school buildings with better light there are fewer scoliotics.

The Sitting Posture.—The second cause listed by Scholder as the cause of scoliosis in school children is the prolonged sitting posture. Long hours, he says, tire the muscles, and to rest the child assumes lateral postures. This also, although of some influence is only indirect, vague and most unsatisfactory. The beating about for an explanation in default of the

genuine one, is also illustrated by the peculiar causes ascribed in the case of girls, the supposed fact of their sitting with their dresses and skirts more thickly bunched under one of the hips than under the other.

His third reason, that the desks are not adapted to



FIG. 12. — Japanese and Chinese method of holding the writing-brush.

the size of the children approaches closer, but still leaves the mystery untouched.

Placing of the Writing Paper.—His fourth reason is the wrong position of the writing paper, copy book, etc., and “this,” he says, “is of the greater signifi-

cance in etiology." With the paper placed to the right, he adds, it is skewed, and the written letters slant to the right. "The left eye is thereby brought nearer the paper than the right and therefore there are more left-eyed myopes than right-eyed myopes in our schools." To remedy this faulty placing of the eyes, "the body is turned to the left, producing torsion; the right forearm is turned from the body, the left supports it, the left shoulder is raised, the right depressed, and the spine is curved to the left. Hence the eyes suffer from myopia and scoliosis is produced. The largest portion of our pupils assume this position and it should be forbidden." Now unless 98 percent of the Lausanne children are left-handed or differ from other mundaners as much as the Martian children may differ, not a word of this is true. It is all exactly the reverse with any righthanded child. One cannot understand how such statements can be made, nor what meanings can have been attached to the terms "left" and "right," etc.; and malposture has little or nothing to do with the etiology of myopia.

He says further that if the paper is placed in the median position, straight or skewed, "the Grundlinien of the eyes instinctively seek parallelism with the lines." The more the paper is skewed to the left the more the head and body are depressed to the left and the greater the torsion, and thus are produced the right curvatures. This observation of the instinctive

seeking for parallelism of the *Grundlinien* of the eyes with the lines of the paper (the horizontal rulings, or the vertical written one?) constitutes a dim and inaccurate perception of one of the most important and real factors at work. But why this skewing of the paper? is a question not asked nor answered. And what the *Grundlinien* of the eyes may be, and why the instinctive search for parallelism exists, are suggestions, not answers, of the deeper question and fact. Scholder thus explains the origin of the right curvature by the skewing of the paper to the left and the bending of the head and body to the left. These curvatures, however, according to him, constitute only something like 30 percent of the total of initial ones, and so the 70 percent of left curves must, it would seem, be explained by the placing and skewing of the paper to the right and the resulting bending of the head and body to the right. But there are no such positions of the paper, the head and body, assumed by any right-handed child! And for the simple reason that in such a supposed position the hand utterly prevents vision of the writing field and even of the pen. To emphasize the necessity of teaching vertical writing Scholder says that of children with curvatures the following were the proportions:

	Slant Writers.	Vertical Writers.
Nürnberg	24%	15%
Zürich	32%	12%

	Slant Writers.	Vertical Writers
Munich	24%	15%
Furth	65%	31%
Wurzburg	28%	8%

The average of the first column is about 30 percent, of the second, 16 percent. Taking the figures at their "face value," it would appear that the slanted writing produces less than twice the number of scolioses that the vertical style causes, but that the vertical style is responsible for $\frac{1}{6}$ of the chosen examples. The figures still leave over 50 percent of the total number of cases of scoliosis to be caused by some style of writing other than the slanted or vertical. The logic and the observation seem equally strange and inconclusive.

The Sense of Equilibrium and Adjustment.—The mechanism which controls the establishment of equilibrium and adjustment dominating the development of scoliotic malfunction, is also largely the result of a visual necessity. The vertical and horizontal positions of the head, *i. e.*, the 90° and 180° axes of astigmatism, must be preserved in order to render bodily action or motion skilled, certain and safe, and vision clear. The prevalent axes of astigmatism serve a function not unlike the hair lines of a transit or theodolite, *i. e.*, they guide all judgments of horizontality and verticality. I suspect that the semicircular canals of the ear are less the organ of equilibrium than are the eyes, and that seasickness in swinging or on board ship

is a visual rather than an aural phenomenon. The astigmatism lines are negative, and variation from them of head-poising is the warning and danger signal. The necessity is so great of aligning the dominant axis with upright objects, printing, etc., that head tilting results when the dominant axis is, say, 75° , and not neutralized by a symmetric axis in the fellow eye. In these head tilts the pathologic results in the spine, etc., are different from those in which the head preserves its verticality; and they differ also in this that the mental and psychic troubles are greater in the head tilts.

The Relations of Occidental and Oriental Writing Postures and Methods to Spinal Curvature.—In China and Japan the habits and methods of writing present throughout the most noteworthy contrasts to those customary with us. The particulars may be briefly epitomized as follows:

1. The writing begins at the upper right-hand corner of the paper, giving an evident advantage in seeing the writing field or the letters which are being formed and especially with the right or dominant eye.
2. The lines of writing are from the top to the bottom of the page, thus again securing increased visibility of the writing field.
3. There is thus no need and no practice of skewing the paper to secure unimpeded vision of the writing field. The writing is naturally vertical.

4. The writing brush (corresponding to our pen and holder) is grasped from two to three inches from the brush-tip (corresponding to our pen) ; it is held usually between the second and third fingers (instead of between the thumb and first finger, as with us), and either upright or slanting away from the writing space, to the right, and not, as our children are instructed, with the holder pointing over or to the right shoulder. Each one of the methods of holding the brush aids decidedly and collectively very powerfully in keeping the writing space clearly in view of the vision of both eyes. It seems almost as if all these methods were consciously designed that the writing field might be seen (Fig. 12).

5. In addition, native Japanese and Chinese tell me it is a habit of many to hold the paper with the left hand, in the air, and pitched at an angle of from 30° to 50° . I did not know of this custom until months after I had written, advising a pitch of the leaf of the writing desk of 30° . A greater pitch than this would sometimes not permit the ink to flow freely from our steel pens. The medieval copyists used a pitch of 50° or over, and our modern draughtsmen and artists often do the same. Modern artists in painting and sketching secure the clear view of the field of work by setting their canvasses nearly horizontal and by holding the brush or pencil from three to ten inches from the point. There are more modern writers than we suspect who

increase the extent of visibility of the writing field by holding the pen between the first and second fingers, or by grasping the holder two or three inches from the pen-point, by turning the hand upward, or by slanting the pen-holder to the right. But these are devices forbidden by teachers (and writing books) who have no perception of the simple reason why the so-called "incorrect habits and postures" are unconsciously chosen.

6. Whether we should imitate the Oriental methods described above, either in part or not, is at present not my concern. Their result is our one great desideratum—the preservation of the erect and hygienic posture during the writing act. There is little or no bending of the head to the left. If this functional right cervical curve, habitual in the Occidental writing posture, is the cause of the incipient spinal left curve of our school children, it follows that there will be far less than 27 percent of Japanese and Chinese children showing such curves between the ages of 7 and 14 years. An orthopedic examination of the backs of a large number of the children of Oriental schools would yield interesting and critical results. A minor query would be as to the proportion of scoliotics among Occidental children blind from infancy.

1. The first part of the document is a list of names and titles.

VISUAL FUNCTION THE CAUSE
OF SLANTED HANDWRITING;
ITS RELATION TO SCHOOL-
HYGIENE, SCHOOL DESKS,
MALPOSTURE, SPINAL
CURVATURE AND
MYOPIA.

100

100

100

100

100

100

100

100

100

100

100

100

100

100

CHAPTER VIII.

VISUAL FUNCTION THE CAUSE OF SLANTED HANDWRITING; ITS RELATION TO SCHOOL- HYGIENE, SCHOOL DESKS, MALPOSTURE, SPINAL CURVATURE, AND MYOPIA.¹

Slanted Handwriting is Bad, but not because of Bad Reasons.—Careful and trustworthy statistics show that on the average 27 percent of the pupils in the primary grades of the schools of Europe have lateral spinal curvature. The fact is as terrifying as the greatest in pathology, as bad, for instance, as the prevalence of tuberculosis. There is no reason to doubt that American children are less scoliotic than those of Lausanne, Dresden, etc. If not actually crying out against slanted handwriting and school desks as the causes of this appalling disease, almost all orthopedists and school hygienists admit or suggest it. And yet slant handwriting is not only not the cause of the writing malposture and of scoliosis, it is only a minor effect of the writing malposture. It is not only an effect, but, bad as it is, it is a method of avoiding worse malposture. To no one could such a style of writing be more repulsive than to me, and yet, as one must so often emphasize, the bad reason does not

¹ From the *Medical Record*, April 22, 1905.

make it bad. The reasons for vertical *vs.* slanted handwriting must be scientific and true or the slant-



FIG. 13. — Habitual posture of head and shoulders of a patient with an axis of astigmatism in the dominant eye that compelled the head-tilting, depression of the right shoulder, etc., and caused curvature of the spine.

ing will never be done away with. There are considerations very different, and of infinitely more importance than the slanting itself, why such writing must be abolished.

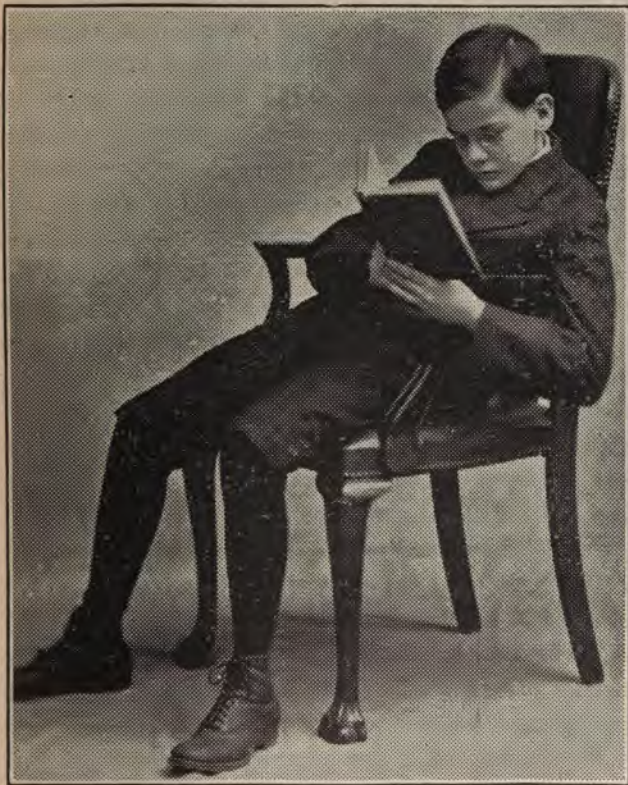


FIG. 14. — Habitual reading posture of a boy with beginning lateral curvature of the spine caused by a peculiar axis of astigmatism.

Factors of the Writing Malposture.—All acts or habits are wrong some of the time, and some acts or habits are partly wrong all of the time. Only the act of writing, as commonly carried out, is wholly wrong all the time.

1. In a state of rest every object illustrates and obeys the law of gravity, equilibrium, or architecture, which demands that its center of gravity must be vertically above its base or point of support. A feeling of strain or irritation arises in the mind when natural objects do not conform to this law. Tumbling-down chirography does not obey this law.

2. The letters of the alphabet are conventionalized pictures or ideograms of the pictograms or pictures of natural objects—the ox, horse, camel, door, window, hook, serpent, hand, fish, water, eye, mouth, head, etc. These prototypes, of course, obeyed the law of verticality in Phœnician and Semitic times as they do now. The modern written letters of the alphabet should do the same.

3. All printed and type-written letters and musical notes preserve the erect position. The handmade letters should conform to the rule.

4. The slant method of writing is a result of the writer's personal difficulties, but the character of the writing is, or should be, dictated by the consideration of the reader's sake, not because of the writer's personal or pathologic trouble.

5. More important than all the foregoing is the fact that the vast majority of all persons have some astigmatism, and about 95 percent of all astigmatisms are at or about the axes 90° and 180° , and such eyes demand the prevailing lines of things seen at 90° or 180° .

Even if no astigmatism is present, or if that which is present is not in the neighborhood of 90° or 180° , the habit of equilibrium, and the inheritance from all ancestors of the habit of holding the head erect and of seeing with the eyes coincident with the usual 90° and 180° axes, would compel the customary position.

The secondary factors, which determine the posture and malposture of the body and the character of the handwriting, vertical, slanted, or otherwise improper, are:

1. The position or posture of the head.
2. The position or posture of the body.
3. The location of the paper upon the desk.
4. The angling or skewing of the paper as regards the right angles of the desk-top or writing-board.
5. The flatness or inclination of the desk-top or writing-board.
6. The relative height and distance apart of the desk and seat.
7. The position of the hand, method of holding the penholder, etc.
8. The necessity of parallelism between the vertical

axis of the head, or what is the same thing, of the 90° axes of astigmatism of the eyes, and the vertical lines, real, supposed or presented by the formed lines of the written letters.



FIG. 15.—The hand in the writing posture as usually ordered, but not practised because to the writer the writing-field is hidden by the thumb, finger, and holder. An actual view of the hand with the writer's head displaced.

9. The relative position of the right or dominant eye, and the unhindered meeting of the visual axes of

both eyes upon what may be called the writing field, *i. e.*, the space at and about the pen-point.

In other articles (*Popular Science Monthly*, August, 1904: *Ophthalmology*, October, 1904) I have explained the terms *dominant eye* and *dextrocularity*. The relation of the writing malposture to the production of lateral spinal curvature I have set forth in *American Medicine*, April 8, 1905.

Briefly epitomized, this etiologic factor arises from a bending of the head to the left, skewing of the paper, etc., in writing, in order that both eyes of the writer may have a clear view of the writing-field or space about the pen-point. And especially by the right or dominant eye, the one corresponding in function, and particularly in writing, with the right-handedness (expertness) of the right-handed person. This canting of the head to the left produces a functional cervical curve with the convexity to the right, which I suggest is the primary factor in the formation of subsequent compensation curves of the spine below. Orthopedists seem to have forgotten that the cervical vertebrae are part of the spinal column; any lateral bending of any part of the column produces twisting or rotation, with the production of reverse or secondary curves later, in the effort at compensation. (Figs. 13, 14.) George Sand and all the advocates of vertical handwriting have persistently demanded *écriture droite, sur papier droit, corps droit*

—vertical handwriting, on vertical paper, the body also vertical. Knowing what was and is intended by the words, not what literally is said, we may add that even this intended advice is impossible of execution.



FIG. 16. — The common but in the picture somewhat exaggerated, writing malposture, method of holding the pen, skewing the paper, bending of body, torsion of head, etc., in order to gain a clearer view of the writing-field.

No right-handed person ever writes so, or could write so, *i. e.*, if the paper (as supposed) is horizontal, placed squarely (not skewed) before the median line of the

body, and the penholder held as instructed in the "correct position," *i. e.*, with the upper end pointing toward the shoulder. No one ever wrote a line in this position, and simply because he could not see the letters he was making. And to write we must see the letters which are being formed. (Fig. 15.)

Details as to the Nine Factors of Malposture in Writing.—

1. The position of the head may be :

a. Perfectly erect, its long or vertical axis corresponding with the vertebral axis when the body is erect and accurately and squarely in front of the desk.

b. Canted or tilted to one side, to the left in the dextral, and in varying degrees.

c. Twisted on the vertical axis of the head and neck, to the right in writing, by the dextral.

d. Positions *a* and *c*, combined or mixed.

e. Positions *b* and *c*, combined or mixed.

2. The posture of the body may be :

f. Erect, the lateral axis parallel with the front line of the desk.

g. Bent to the left (in the dextral) in varying degrees, the vertebral column being either straight or curved.

h. The spinal column twisted in varying degrees.

i. The right side of the body turned toward the desk or approximated to it more or less.

j. Varying combinations of the positions *g*, *h*, and *i*.

In practical and unconscious writing the positions of the head and postures of the body above enumerated under 1 and 2 may be and usually are mixed and interdependent, thus resulting in many modifications and variations.



FIG. 17. — The medieval copyists wrote with the paper pitched at a sharp angle.

3 and 4. The location and angling of the paper upon the desk may be:

k. In front of the face and squarely placed, *i. e.*, its lower border parallel with the front of the desk.

l. Askew, at varying angles to the left, but usually at an angle of about 35° with the desk front.

m. With the left hand border parallel with the desk front.

n. Opposite the right shoulder in head and body postures *a* and *f*, the lower border parallel with the desk front.

With the ordinary straight penholder and pen held as universally ordered and the head and body in postures *a* and *f*, no ordinary human being can write, because the index finger and the pen necessarily come between the right eye and the pen-point. (Fig. 15.) Therefore, every writer immediately disobeys the teacher and varies one or all of the positions, postures, etc., so that the dominant eye has an unobstructed view of the writing field. (Fig. 16.) The most extreme position of the body and head I have ever seen was in a patient who had an enormous astigmatism, and who was compelled to bring the eyes almost to a level of the table, with extreme rotation of the head in order to bring the astigmatic axes into parallelism with the lines of the writing being executed. Position *n* of the paper is the only one that permits of the perfectly erect or hygienic postures of the head and body designated as *a* and *f*, because only under such conditions can the dominant eye have a clear view of the writing field.

5. But the difficulty of writing in these postures



FIG. 18 — The usual writing posture. The body and head are bent to the left, the head in addition, rotated so that the chin is to the right; there is a cervical curve with the convexity to the right; the right side of the body is turned toward the desk; the paper is skewed to the left; the predominant 90° axes of astigmatism, dd , are at approximate right angles to the vertical lines of the paper, aa ; to lessen the strain upon the body, neck and eyes, the approximate parallelism of the lines cb , with the lines aa , of the skewed paper is varied, causing the obliquity of the written letters to the right, or the slanted style of handwriting.

and conditions is greatly increased by the flat desk, and is almost done away with by an inclination of the desk leaf or writing board at an angle of 30° . The ink will still flow from the pen with the leaf at this angle, the position of the head and body made most comfortable and hygienic, and the unconscious tendency to bend the head and body is neutralized. The copyists and monks of medieval and Latin times learned this, as is illustrated by the annexed cut. (Fig. 17.) An added and highly important consideration is that by the 30° or 40° sloped desk leaf, the eyes are enabled to look off at the book or writing at nearly a horizontal line, instead of down upon it with the eyes nearly vertically over the letters. The traction on the inferior recti muscles of the eyes with the resultant unnatural position of the eyes, is a prolific source of eyestrain. It also compresses the chest, humps the back, interferes with the circulation of the neck, the supply of blood to the brain, and the flow of air in and out of the lungs in breathing. The inclination of the desk may be more pitched in reading than in writing.

o. The child's feet must rest lightly and naturally upon the floor, with the knees bent at about a right angle, the body at the proper distance from the edge of the desk. This can be effected only by means of a seat that may be raised or depressed, and not attached to the floor.

6. The organizers, teachers, trustees, furniture

makers and parents have too often failed to notice that children differ in height from adults, differ from each other and that they have a habit of growing. Even the most progressive in very recent years have not come to a thoroughgoing knowledge of these simple facts, and have not made the school desks and seats to conform accurately to them. What is now needed is mechanical constructions which will meet the differences of each child in an easy and perfect manner.

p. The leaf of the desk, in addition to being inclined at an angle of about 30° , must be of a height which brings the printed book and writing paper at a distance of about fourteen inches from the eyes.

q. The pedagogs have also usually failed to notice that in reading a book it may be placed opposite the median line of the body or face (in erect position), but that in writing the paper cannot be thus placed. Hence the frequent permission in writing to turn the right side of the body toward the desk. When the paper is placed opposite the right shoulder upon a sharply-inclined desk leaf of the proper height, the eyes can see the writing field without unnatural positions of the body and head.

7. Everyone has probably wondered why, when the school and writing teacher are ignored or forgotten, the pen and holder are either slanted differently; held between the first and second fingers; not seldom angled

1. The first part of the document is a list of names and titles, including "The Hon. Mr. Justice" and "The Hon. Mr. Justice".

parallel with the lateral lines of the paper, even nearly vertical, or toward the upright lines of the paper; drawn inward and toward the chest, the eyes above and looking down vertically upon the sheet; and the head in various other unnatural and cramping positions. (Fig. 18.) Such anomalies are too frequent to be called anomalies and are simply the unconscious morbid methods whereby the dominant eye gets a free view of the writing field. The types of this unhygienic pen-holding are too numerous and anomalous to be classified.

Artists, by means of long-handled brushes, etc., are able to gain a clear view of large spaces about the point of the brush, pencil, etc., by grasping the handle several inches from the point. They are thus under no necessity of inclining the head and body. Also their canvases, easels, etc., are either vertical or nearly so, and this does away with the visual difficulty encountered when the surface is horizontal or only slightly inclined. There is a simple method whereby the writing field or space about the pen-point may be seen without canting the head and body to the left and with the paper placed squarely in front of the body. This is by means of angled penholders which I have devised and of which I show cuts of some styles. (Figs. 19, 20.) The difficulty in holding these without the depression of the angled parts is obviated by flanges or supports for the fingers. Of

course they seem odd and "awkward" at first, but one soon writes with them easily and unconsciously. And with them one finds himself writing vertically without effort or intention. Any lateral or unhygienic posture is unnecessary in their use.



FIG. 20.—The writing-field is clearly seen with an angled holder, the body, head, and hand being hygienically posed and the paper vertical and opposite the median line of the body, upon a flat desk or table.

8. Some authors describe postures in which the body is leaned to the right, but they are not practiced because the writing-field is thus hidden to a greater degree. (Figs. 21, 22, 23, 24, 25, 26.) In all the mul-

titude of improper postures, positions, pen-holdings, etc., the teacher of writing, hygiene and physiology have failed to notice that by some device nature will bring it about that the 90° axes of the eyes and astigmatism will be forced into parallelism with the vertical or slanted lines of the long letters being written. Hence the multiplicity of morbid postures begotten by the failure to place the paper properly before the right shoulder and with the head and body erect, with the inclined desk leaf and the penholder properly seized.

9. Only when these conditions last named are assured has the dominant eye an unobstructed view of the writing-field at the proper distances, etc. To secure this clear view of the writing-field with the paper placed according to universal instruction, the head and body are forced into unnatural positions. The unnaturalness and weariness of these morbid postures are lessened a little by the slanting of the letters to the right and the tendency of the line of writing to slant upward. This any one can demonstrate by a few thoughtful tests or observations. And this is the source of slanted handwriting. (Fig. 18.) It is in fact a method of avoiding still more extreme torsion of the head or neck—a greater morbid slant of the patient by a slant of the writing.

I cannot find that anyone who has written of handwriting or of school hygiene, or who has constructed

or advised as to the making of school desks and seats, has ever dreamed of the patent and easily recognized fact that every one of the nine factors are verities, and that they are bound together into a coordinate unity. None of them can be much changed without changing all of the others, and unconsciously every pupil and writer has solved the problem of carrying out the writing act by a special and personal adaptation and modification of each of the factors mentioned. The one all-dominating necessity which everyone discussing the subject seems to have overlooked, is that the writing-field (the space about the pen-point) shall be seen, seen with both eyes, but especially seen with the right eye. I speak of right-handed and right-eyed persons. All is reversed as to the left-handed and left-eyed. The essence of the matter is the necessity of bimocularity and especially the existence of dextrocularity, a hitherto unrecognized thing, and the most intimate coordination of the right eye and right hand in the most mental and intellectual of all acts, except speech—that is, writing. The positions usually taught by school-teachers, writing-teachers and copy-books are next to impossible, certainly not practised by the child or man when writing much or unconsciously. Then nature modifies all the nine factors mentioned, solely and simply in order that the hand, fingers and pen shall not come between the right eye and the writing-field.

The pathology of school life in a multitude of symptoms and diseases consists for the greater part in the unhygienic attempts to see the writing-field with the dominant eye. And the two great blunders of all the teachers and desk-makers are that the penholders and pens are not shaped so that the writing space or field about the pen-point can be seen with both eyes when the body and head are erect; or that the desk is not inclined at an angle of about 30° , and the writing paper is not placed squarely and opposite the right shoulder, with the body and head erect and squarely postured before the desk. With the paper so placed, the desk top so inclined, the body and head thus erect, the right eye sees the paper at twelve inches or fourteen inches and the writing is vertical. (Figs. 27, 28.)

Probably as many as two hundred distinct styles of school desks and chairs have been proposed, tried and rejected or in use. The reader may find some of these described in works on school hygiene, such as those of Kotelmann, Meyer, Staffel, Fahrner, Rettig, Hermann, Bendzula, Schildback, Schenk, Hippauf, Prausek, Wallraff, Barnard, Priestley Smith, Stone,¹ Shaw,² and especially Risley.³

So far as these relate to reading of a single book, the results reached by students of pedagogy are of

¹ *American Physical Education Review*, June, 1900.

² *Ibid.*, June, 1901.

³ Norris and Oliver: "System of Diseases of the Eye," Vol. II.

great value—but with one exception: All advise an inclination of only 10° or 15° . It should be at least 30° , and with easily made devices for holding the book should be 45° . Even with the 30° inclination



FIG. 21. — A malposture pictured and described by authors, but never practiced by one in writing, because the writing-field would not be visible. The artist unconsciously shows the cervical curve with convexity to the right, almost always present in dextral writers.

the pupil will often hold the book with the hand at a greater inclination, and there is no reason why every desk should not be inclined at least 30° . When two books are used at one time or when the pen or pencil

is used synchronously with reading, the inclination must be greater than 15° , in order to permit hygienic posture. In the writing act hygienic posture is almost impossible with less than a 30° pitch. This fact, together with insufficient space at the right, largely vitiates all previous results, decisions and mechanisms as regards school-desks. The simple device needed is one which will permit a varying and independent pitch of the two vertical halves of the desk itself.. It should be possible to give either any pitch between 15° and 45° , and with devices so that the book, slate, paper pad, etc., will not fall and may be held in place without the hand. If the pencil is used, even as high a pitch as 40° or 45° will be grateful to the body and eye. If ink is used, the pitch should be at least 30° , as with this inclination the ink will still flow, and only with so high a pitch is there possible a view of the writing-field with the right eye and at fourteen inches distance, when the paper is placed opposite the right shoulder, with the head and body erect, without elevation of the right shoulder; this insures free motion of the right arm and hand in unconstrained and normal positions. (Fig. 28.) The copyists of the middle ages found this to be true, and our school-teachers of former generations, who were their direct descendants, for a time kept up this wise tradition. The desk-top should be made in two independent halves, the upper or farther edges so constructed that either may be raised, thus

varying the pitch from the minimum of 30° to a maximum of 45° and thus adapted to reading or writing at pleasure. Thus made, the right-hand leaf would be



FIG. 22. — Some hygienists describe a form of malposture consisting in skewing the paper to the right and bending the body and head to the right; it is never practised because the writing-field is still more hidden than in the posture of Fig. 15 ordered as "correct."

the only one used for writing. All pupils, should, of course, have desk and chair so adapted to their height

that the book or paper would be at fourteen inches from the eye when looking down upon it with a visual axis at an angle or inclination not greater than 150° or 155° . The visual axis at about 150° should approximately form a right angle with the inclination of the desk leaf at about 30° . (According to the oculist's trial frame and as figured in illustration, the desk top should be at 145° and the visual axis at 35° .)

The Relation of Occidental and Oriental Writing Postures and Methods to Spinal Curvature.—In China and Japan the habits and methods of writing present throughout most noteworthy contrasts to those customary with us. The particulars may be briefly epitomized as follows:

1. The writing begins at the upper right-hand corner of the paper, giving an evident advantage in seeing the writing field or letters which are being formed, and especially with the right or dominant eye.
2. The lines of writing are from the top to the bottom of the page, thus again securing increased visibility of the writing-field.
3. There is thus no need and no practice of skewing the paper to secure unimpeded vision of the writing-field. The writing is naturally vertical.
4. The writing brush (corresponding to our pen and holder) is grasped from two to four inches from the brush tip (corresponding to our pen); it is held usually between the second and third fingers (instead

of between the thumb and first finger as with us), and either upright or slanting away from the writing space, to the right, and not, as our children are instructed, with the holder pointing toward the right shoulder. (Fig. 29.) Each one of the methods of holding the brush aids decidedly, and collectively very powerfully, in keeping the writing space clearly in view of the vision of both eyes. It seems almost as if all these methods were consciously designed that the writing-field might be seen.

5. In addition, Japanese and Chinese friends tell me it is a habit of many to hold the paper with the left hand, in the air, and pitched at an angle of from 30° to 50° . I did not know of this custom until months after I had written advising a pitch of the leaf of the writing desk of 30° . A greater pitch than this would sometimes not permit the ink to flow freely from our steel pens. The medieval copyists used a pitch of 50° or over, and our modern draughtsmen and artists often do the same. Modern artists in painting and sketching secure the clear view of the field of work by setting their canvas nearly vertical and by holding the brush or pencil from three to ten inches from the point. There are more modern writers than we suspect who increase the extent of visibility of the writing-field by holding the pen between the first and second fingers, or by grasping the holder two or three inches from the pen-point, by turning the hand half upward,

or by slanting the penholder to the right. But these are devices forbidden by teachers (and writing books), who have no perception of the simple reason why the



FIG. 23. — View of the writing-field as seen by the writer with skewed paper, and body and head turned to the left.

so-called "incorrect" habits and postures are unconsciously chosen.

6. Whether we should imitate the Oriental methods described above, either in part or not, is at present

not my concern. Their result is our one great desideratum—the preservation of the erect and hygienic posture during the writing act. There is little or no



FIG. 24. — To gain a better view of the writing-field the pupil instead of leaning to the left, sometimes bends forward until the eyes are directly above or even in advance, of the writing, lateral curvature and rotation being thus avoided.

bending of the head to the left. If this functional right cervical curve, habitual in the Occidental posture, is the cause of the incipient spinal curves of our school

children, it follows that there will be far less than 27 percent of Japanese and Chinese children showing such curves between the ages of seven and fourteen years. An orthopedic examination of the backs of a large number of the children of Oriental schools would yield interesting and critical results. A minor query would be as to the proportion of scoliotics among Occidental children blind from infancy.

That the approximation to the upright posture (not its absolute practice) lessens scoliosis is apparently shown by the following statistics of examinations of school children:

	Slant Writers.	Vertical Writers.
Nürnberg	24%	15%
Zürich	32%	12%
Munich	24%	15%
Furth	65%	31%
Wurzburg	28%	8%

The first column averages 30 percent, the second 16. But if the slanted style is accountable for twice as many scoliotics as the vertical, the vertical is still, apparently, responsible for one-half as many as the slant. It is, therefore, evident that the vertical style did not insure the vertical position of the head and body, or that some other cause is at work. If the true reason of malposition in writing had been understood, and the conception of its cure realized, the results and their suggestions would have differed and

been of greater value. The above great differences found in different cities also exhibit an inexactitude which makes one doubt the value of the methods employed.

The School Desk.—There is probably not a pupil's desk in the world constructed upon correct physiologic principles. Many approximate, but fail in one or more important particulars. This is because, with all of the interest, study and invention which have been put into the work, with all that has been written concerning the vertical and slanted handwriting, there has been no understanding of the physiology of dextrality and dextrocularity, no comprehension of the optic problem which controls every posture and act. The wrong to the child began with the beginnings of pedagogy. Prior to this handwriting was usually vertical, because without a powerfully dominating necessity no adults, much less the shrewd monks, would have bent themselves to the left and skewed their vellum, tablet or paper at the absurd angle now common with all writers. But when school teaching began it was, of course, in the houses or rooms of adults, and with their tables, benches, forms or stools. No one then dreamed of the peculiar child nature, not even the size of the child's body. Hence, he sat upon a bench or seat too low, or what amounts to the same thing, at a table too high for the height of his body, and at about the level of his ster-

num, neck or chin. When compelled to write he could do nothing at the desk, except by placing his forearm, and even his elbow, upon the table. Let an adult try to write sitting at a flat table the height of his neck



FIG. 25. — The writing-field brought into clear view by holding the penholder between the first and second finger, thus lessening the need of bending the body or head to the left. The view is as the writer sees it, his head being out of the field in order to photograph the hand.

and he will realize the child's predicament. With the arm upon the table there can be no writing accomplished unless the head is canted to the left, the body also, the paper placed askew, the feet or one foot

thrust out to lessen the strain and wrenching of the spine, the pen held at a related abnormal angle, and the hand gripping the holder in a distorted way. (Fig. 16.) All this, that the right eye may have an unimpeded view of the space in which the letters are being



FIG. 26. — To secure a better view of the writing-field the hand is held in a straining and unnatural position, the holder directed 90° to the right of the right shoulder.

formed. Think of the millions of morbidly raised right shoulders, the millions of necks and backs thus wrenched, with all the resultant disease, and during the last 400 years! And still going on!

Most school-desks are without lateral space to the right in which the paper may be placed opposite the right shoulder when the body and head are erect and squarely placed in front of the desk, and not as now in front of the face or chest. This lack of lateral space to the right has always been the **unrealized need**, and upon securing it the complete **establishing** of the vertical style of handwriting will **depend**, as also the rescue of the child from the bad **postures** and ill-health caused by the diabolic **head-tilting**, **right-shoulder-elevating**, **eye-ruining**, **body-bending**, **pelvis-cramping**, **spine-twisting**, **scoliosis-provoking** postures, which have come down to our time. It will be useless to demand of the child that he shall write vertically, sit vertically, place the paper squarely and not askew, and opposite the median line of the body. No human being can write in that way unless the pen holder is held with the tip directed toward the northeast, or upper right corner of the paper (Fig. 26), or even toward the north, all sure to produce writer's cramp, or other evil results in a short time.¹ In former times, as we know, the chil-

¹ Some time after these words were in type, a striking confirmation was found in an article published without any knowledge of my work. I quote the paragraph:

"One thing, however, has been much impressed upon me, and that is that those who are normally left-handed and are taught to write with their right hand, suffer from writer's cramp much more readily than normally right-handed indi-

dren were crowded together side by side so that it was impossible to place the paper opposite the right hand side of the body and keep the body and head erect. The high desk united to compel the arm to be rested upon the desk, the right side to be turned toward it, the left side away from it, the head and body bent to the left in order to gain a clear view of the writing space of the pen-point with the dominant eye. Even the flat desk or table cooperated to produce the resultant bad posture and the slanted chirography.

In all left-handed writers the foregoing factors and results are reversed, and the writing is back-handed, or slanted to the left. (Fig. 30.)

There has also been much error in the statements made as to the history of slanted handwriting. The superb *History of the Art of Writing*, by Dr. Henry Smith Williams, gives an illuminating series of examples which show that the slanted handwriting appeared much earlier than has been supposed. Despite the high-pitched slope of the desks of the professional and more learned scribes, and also notwithstanding the dictation of the original vertical engraved, etched, or painted patterns, the slanted

viduals. It would seem as though nature were taking her revenge for an interference with her original plan, for the man is right-brained and should not be compelled to use his right hand for a work requiring so much coordination as does writing." ("Some So-called Rheumatisms," J. J. Walsh, *Medical News*, February 18, 1905.)

style appears throughout the Middle Ages, as the necessary result of the writing posture consequent upon the flat table, etc. Even in A. D. 93, the letters of a Greek MS. plainly lean to the right, and in a cursive Latin imperial rescript of the fifth century the slope is 15° . In a grant to the Church of Ravenna of the seventh century, the right oblique slant is 10° or more, and even in Magna Charta all letters lean to the right somewhat. Examples of similar slanting are found in the handwriting of Michael Angelo, Macchiavelli, Ariosto, Tasso, Luther, Shakespeare, Bacon, Lope de Vega, Milton, Locke, Leibnitz, Johnson, etc. Montaigne, Spencer, Galileo, Corneille, Addison, Pope, Newton, Voltaire slanted their letters to about the same extent as is now customary. Dante, Piers Plowman, and others wrote the vertical hand. Goethe leaned his letters extremely, Schiller less so, while Tennyson's were nearly vertical. Thackeray's were absolutely upright. Of the signers of the American Declaration, only one is in vertical letters. Longfellow wrote a "backhand," and in a MS. of the tenth century the letters also lean to the left, as do MSS. of Henry II and Richard I. In King John's Charter the letters are generally upright, although many letters slant to the left, especially lower case *d*, and capital *D*. Of course the best writers and penmen were usually intelligent, and wrote more nearly correctly, *i. e.*, vertically, while the writers of the lower



FIG. 27. — The normal or hygienic posture of the body and head with the paper placed vertically and opposite the right shoulder. The arm and head thus have free motion. There is some constraint, due to the flat desk, a too great distance of the writing, and the fact that the visual axes, falling at an angle of about 45° , demand a bending of the head forwards, or too great traction on the depressor muscles of the eyes.

and commercial classes illustrate the degeneracy which quickly overcame the cursive style of writing. In general, the older and more important styles of headings, those in capitals, etc., were upright, while the less important and the body of the writing showed the inevitable leaning that came with crowding and cursive writing. An instance of this is our own Declaration of Independence, a few lines of which next to each other I reproduce. (Fig. 31.)

Malposture Not the Cause of Myopia.—In almost all the discussion as to school desks, especially that originating in Europe, there is much said about the influence of malposture in producing myopia, and it is largely twaddle. The tremendous gathering of statistics and the thoughtless ascription of the truly tragic increase of myopia to malposture in study and writing are essentially wide of the mark. Some accidental, incidental and subordinate influence is, indeed, to be ascribed to the malposture criticised. Kotelmann's pages concerning myopia are, for instance, wholly misleading, and utterly ignore the real cause—which is the noncorrection of ametropia, and especially of astigmatism. In Germany, the motherland of myopia, there is no scientific correction of ametropia. The very simplest and most fundamental conditions of accuracy are wilfully or ignorantly unnoticed, and the ocular, nervous and nutritional systems are hopelessly ruined and by wholesale. With one splendid

exception our American students of the subject have usually adopted the European blunder, and for a hundred years we shall doubtless have the empty echoings



FIG. 28. With the desk-leaf pitched at an angle of 30° or 40° , the posture is hygienically perfect and the faults of Fig. 18 are entirely avoided

of the European nonsense as to school desks and myopia.

In an article (published in the *Klin. Monatsbl. f. Augenheilkunde*, July, 1904, and translated in the *Annals of Ophthalmology*, January, 1905), Dr. Liebreich lends his authority to the error that myopia is caused by the combined action of too strong convergence and too great an accommodation tension, quoting the investigations of Cohen, Hersing, Seggel, and others. This inversion of cause and effect does not prevent the true statement that "through the too near approach of the head to the table the normal curvature of the spinal column is increased and by simultaneous rotation of the head and body lateral curvature ensues." Of course, all such statements and explanations miss the causes of the cause which are the action of astigmatism in producing myopia, its effect in compelling parallelism of the axes of the astigmatism and of the written lines on the paper, and the more fundamental necessity of binocular vision of the writing-field. Scholder also says that myopia is produced by getting the eyes too near the paper, because, he says, the more the head and body are depressed and thus myopia is produced. But what is the *causa causans* he never asks. Why the skewing of the paper? In Scholder's table of the increase of scoliotics in the grades of the Lausanne schools he notes in an added column the increase of myopia, as follows:

	Scoliotics.	Myopes.
First grade	8.7%	3. %
Second grade	18.2%	4.5%
Third grade	19.2%	5.2%
Fourth grade	27.2%	6. %
Fifth grade	28.3%	8.5%
Sixth grade.....	32.4%	13.7%
Seventh grade	31. %	19.4%

If the author had scrutinizingly asked himself why the increase of scoliosis is suddenly stopped and decreased at about 14 years of age, and why the rate of myopia at the same time is suddenly increased, he might have seen a suggestion of the cause of myopia. In Dr. S. D. Risley's magnificent article (Norris and Oliver: "System of Diseases of the Eye," Vol. II.) there is a clear understanding and statement of the problem of myopia. Myopia is not due to the bad desk and bad posture, but to the bad or absent spectacles. (I differ from Dr. Risley on one minor point—the astigmatism is not only "the turnstile," but the path, road, and continuance of the road itself, which leads to the bog of myopia.) If every school trustee, pedagog, physician, and hygienist would read every word of Dr. Risley's article five times a year, one of the greatest afflictions of mankind might be obviated. Unfortunately, it is buried from all but ophthalmologists, and the majority of these care too little for this revolutionizing truth.

The remarkable success of all the European investigations in not seeing the cause of myopia is a

Painful illustration of the difficulties in the way of scientific and medical progress. Jaeger, Ely, and Horstmann were approaching the true explanation in their work leading to the measurements of the anteroposterior diameter of hyperopic and myopic eyes; by Arlt and Donders, the latter emphasizing the role of predisposition—that easy, old and still popular word to cover ignorance of the real and active pathogenic factor. Dobrowoesky and Erisman charged the accommodation with the production of myopia, while Förster thought it was due to convergence. Mauthner ascribes the leading role to spasm of the ciliary muscles, while Stilling threw the responsibility upon the obliques and the shape of the orbit—a view opposed by Schmidt-Rimpler and Seggel. Hasner and Weiss contended that myopia is caused by a too short optic nerve, and Schnabel and Herrnheiser by a lessened resistance of the sclerotic. It remained for an American oculist to discover the true etiology which is to-day as much ignored by European oculists and school hygienists as if it had been made this morning instead of thirty-eight years ago. In 1867, and again in 1871, Dr. John Green of St. Louis set forth the explanation, and a few years later Dr. S. D. Risley of Philadelphia demonstrated it by studies of school children's eyes in epoch-making papers, which, within the next generation or two may begin to make the epoch.

The Evils of Eyestrain.—In all of the foregoing there have been considered only the children, students and writers who had eyes so near normality as regards ametropia that they had no severe eyestrain or morbid reflexes from use of the eyes in a



FIG. 29.—Oriental method of holding the writing brush, giving an unobstructed view of the writing-field.

natural way, or even in the unnatural ways begotten by morbid postures; but unnatural posture produces unnatural ocular function, and besides this, from 25 percent to 50 percent of all civilized persons have eyestrain or hurtful use of ametropic eyes. The



FIG. 30 — All malpostures are reversed by left-handed writers and this particular patient gained a better view in his habitual writing by holding the penholder as pictured.

amount of harm done the eyes, the neurologic mechanism, the digestive and assimilative systems depends upon three things: the kind and the degree of the ametropia; the amount of reading and especially of writing done; the susceptibility of the patient, the general vitality, intercurrent diseases, etc. It has been found that from 50 percent to 64 percent of school

The unanimous Dec

*When in the course of
events among the powers of the earth, the separate and equal station to
which they are entitled, should declare the causes which impel them to the separation. —
with certain unalienable Rights, that among these are Life, Liberty
and the pursuit of Happiness. — That whenever any Form of
Government, laying its foundation on such principles and organ*

FIG. 31. — The older the style of writing, the more perpendicular or vertical the letters; the later and more cursive, the more slanted become the letters, even in the same document, *e. g.*, the Declaration of Independence.

children are sickly or below a desirable norm of health. I do not think it is an exaggeration to say that the ills of 50 percent of these hygienically subnormal children and students are due to the morbid postures compelled by the present false methods of writing and reading. Of the remaining 50 percent, a full half are directly caused by the eyestrain of ametropic eyes.

Headache, "weak eyes," migraine, anorexia, dyspepsia and many types of denutrition, spinal curvature, insomnia, "nervousness," many cases of chorea and epilepsy, despondency and frequent psychic disorders, truancy, immorality, etc., almost any form or kind of functional disease—all these, and the denutrition that fallows the ground for the incoming of infectious and terminal diseases—all of these are, or may be, the clear consequences of eyestrain. Only proper and scientific spectacles can extinguish these evils. But without glasses they are tremendously increased and intensified by the morbidities of posture engendered by the present school-desks and methods of writing and reading. A revolution is demanded by an enlightened hygiene in school furniture and methods of writing and study. It is the most profound and crying reform of the day, a matter of national and evolutionary importance almost overtopping all others.

Read the clinical biographies of the great sufferers from eyestrain and note how intolerable and impossible writing becomes. A thousand quotations from their biographies and letters might be made showing that suffering of the most varied and subtle kinds follows directly upon use of the eyes especially in writing, and is at once relieved with cessation of writing and reading. The abnormal and morbid postures caused by nonunderstanding of the optic problems in writing add enormously to the preexisting and attendant eyestrain.

1

DEXTRALITY AND SINIS-
TRALITY.

CHAPTER IX.

DEXTRALITY AND SINISTRALITY.¹

THE theories that have been advanced as to the origin of dextrality and sinistrality are:

1. A natural provision. (Sir Charles Bell and others.)

2. The left-sided location of the heart. (Referred to by Wilson.)

3. A greater supply of nerve-force to the muscles because of an earlier and greater development of the brain upon one side. (Professor Gratiolet.)

4. Obstruction to the flow of blood in the vena cava by the pulsation of the aorta. (Dr. Barclay.)

5. Inspiration produces mechanically a superior efficacy of the muscles of the right side. (Professor Buchanan.) This theory is based upon the observation of the anatomic peculiarities of the liver, lungs, etc., and their supposed influence upon the center of gravity of the body. (So far as pertains to the center of gravity, the theory has been adopted by Dr. Struthers and by Dr. Allis.)

6. The center of gravity theory. The influence of the weight of the viscera of the two sides of the body

¹ From *The Popular Science Monthly*, August, 1904.

upon the position of the center of gravity. (Dr. Struthers, accepted by Buchanan, Allis, etc.)

7. The origin of the subclavian arteries, the left before the right in the left-handed, with superiority of blood-supply to certain structures. (Professor Hyrtl.)

8. The development of one cerebral hemisphere more than the other. (Wilson.)

9. The Topsy theory—"just grew."

These theories merit little argument in rebuttal. No. 3 and No. 8 are essentially the same, and, of course, are mere avoidances of an explanation. No. 2, No. 4, No. 5, No. 6 and No. 7 are not based upon facts, and contain fallacies of observation, rendering them at least of insufficient reach and validity. No. 9 is almost as good as any or all of the rest, and we are left with the frank confession of Dr. Struthers, that the mystery "has baffled satisfactory explanation." Carlyle said it was "a question not to be settled, not worth asking except as a kind of riddle." It is, however, of great and practical importance in medicine and in social life.

In a large way and notwithstanding a certain number of exceptions, it is an illuminating truth of biology that "the ontogeny repeats the phylogeny." We can, therefore, never explain the phases of development through which an organism passes except by knowing the corresponding stages of evolution of the line of its ancestral forms. If, therefore, we ever solve the mystery of dextrality and sinistrality, it will be by the

study of the conditions, habits, necessities, etc., of the ancestral types when dextrality and sinistrality arose. The infant of a few months shows no signs of preference in the use of the hands; it is not yet dextro-manual, nor ambidextral; it is simply nondextrous, or ambisinistrous. Almost as soon as it exhibits any conscious effort toward skillful use of the hands it begins to show signs of dextromanuality. Before it walks, before it is one year old, dextrality is clearly pronounced. Baldwin (*Popular Monthly Science*, Vol. XLIV.) has demonstrated experimentally that it is plainly established as early as the seventh or eighth month. The period in phylogenous savage life to which this of the infant corresponds must, therefore, be that of the earliest phase of humanization. The animals, even the anthropoid apes, do not, so far as I have observed, exhibit it. Vierordt says that parrots grasp food with the left foot, by preference, and that lions strike with the left paw. Livingston is quoted as thinking "all animals are left-handed." I suspect this is all error, because, as a rule, it would disadvantage rather than help in the animalian struggle.¹

¹In the comparative absence of interest in these subjects there is a resultant dearth and awkwardness of words describing the conditions. It seems necessary to coin a few in order at least to avoid more cacophonous ones. The following, some of them already listed in the dictionaries, may be found useful in future discussions:

Dextral, pertaining to the right side of the body.

Since any sort of consciousness of the facts has existed the wisdom of dextromanuality has been emphatically exhibited: (1) In the word *dexterity*, which is the prized and honored quality of savage and civilized man; (2) in the secondary meaning of the word *sinister*—unlucky, ill-omened, evil; (3) in the persistent training of all left-handed children, by parents, teachers, etc., to make them like the rest of the right-handed world. These three facts, the residue of the psychologic habits of ages, persistent in all history, crystallized and embedded in the very language itself which chronicles all mentality, help to give us the clue to the solution of the riddle.

Skillfulness, "handiness," expertness of sense and

Sinistral, pertaining to the left side.

Dextrality, *Sinistrality*, the corresponding abstract qualities.

Dextrad, *Sinistrad*, toward the right, or left, respectively.

Dextromanual, *Sinistromanual*, dextrality and sinistrality, respectively, as relating to the hands.

Dextropedal, *Sinistropedal*, as relating to the feet.

Dextroocular, *Sinistroocular*, as relating to the eyes.

Dextraural, *Sinistraural*, as relating to the ears.

Dextrocardial, *Sinistrocardial*, as relating to the heart.

Dextrohepatal, *Dextrosplenic*, etc., may be formed.

Dextrocerebral, located in the right cerebral hemisphere.

Sinistrocerebral, located in the left cerebral hemisphere.

Dextrorse, turned, turning, or moving to the right.

Sinistorse, turned, turning or moving to the left.

Sinistrous, awkward, unskilled.

Dextrous, skilled, expert.

Ambidextrous, equally skilled with both hands.

act, were the sole means whereby the savage could win his place in the world, domesticate animals, conquer in all sorts of conflicts, supply himself with food, clothing, house, etc. It was necessary that one hand should be chosen to do the dextrous or more skilled tasks, for the simple reason that exercise develops and perfects function, and one would learn to be more skilled and "handy" with one hand than with both. The savage required no treatise on logic nor even any conscious reasoning to teach him this primary lesson. His food and life depended upon his learning it.

But that it was an acquirement, that the law and necessity were not exceptionless, that it was due to no absolute fatalism of anatomy or physiology, is evident from the fact that so large a proportion of left-handed children and adults exist in all races and times. The education of left-handed children, whereby their writing center, naturally dextrocerebral, is by forced training and long habit transferred to the left cerebral hemisphere, is another demonstration that no inherent neurologic or psychologic law governs the location of the cerebral center or its peripheral outworking. When the occasion arose in the humanization process, and the demand for the differentiation of cerebral mechanisms was made, the plastic brain on either side could take up the work. And pure, or untrained, left-handed persons are to-day as expert as their right-handed fellows. All that is needed to explain dex-

trality in 98 percent of children is some ancestral savage custom, habit, or necessity, widely prevalent, which inclined to the use of the right hand and eye for one or two exceptionally intellectual tasks. The inheritance of aptitude, the force of custom, and the necessities of the struggle for existence would certainly fix the persistence of dextrality.

We must not forget that the somewhat sudden and clear preference of dextrality and sinistrality of the child of to-day was in the far-away ancestral line spread out over long periods of time. A year or two of the child's life represents thousands of years of slow acquirement and habit.

Again, it should be remembered that even in our preferences and habits it is only in a few things that one hand, etc., has a greater expertness, accuracy and rapidity. It is often rather a division of functions, a differentiation of ability, than a unique one. In the dextral the left hand does many tasks of as great or greater importance, and with equal or superior skill, as the right. In eating, the fork is now more used than the knife; in gunning, the left hand is given the vastly more important, difficult and onerous task; in chopping, hoeing, shoveling, picking, lathe-work, railway locomotive engineering and other tasks the left arm and hand often execute the chief and more expert tasks. Especially noteworthy is the playing of the violin, 'cello and bass viol. The "fingering" is done

with the left hand, and forms a striking reversal of dextrality, because it is by all odds the function requiring more manipulative skill, accuracy and rapidity. I do not know that the fact itself has ever been observed and stated, but certainly the reason of this strange contradictory practise has hitherto escaped the attention. It is, I think, due to dextrocularity. With few and easily explained exceptions dextromanuality is a result, or a concomitant, of dextrocularity. If the violin, 'cello and viol were fingered with the right hand the learner would be greatly handicapped by the fore-shortening which would exist as his dextral eye glanced along the neck of the instrument straight in front or below this eye. The learner must see his fingers and gain precision in placing them by careful visual estimates. But when placed sinistrad the right eye sees the neck of these instruments and the fingers at an angle which permits more accurate observation, estimates of distances, etc., than would be possible if the instrument were fingered with the right hand. In those instruments necessarily held in the median line, some wind-instruments, the flageolet, hautboy, etc., the right hand asserts its selective and more difficult task. When the hands are not seen at all, as in the flute, fife, etc., the right again has its choice. No pupil with sinistromanuality established can learn piano-playing easily. I know of one who was a great lover of music who failed utterly after long perseverance.

There are other cautions to be emphasized relating to the acquirement of dextrality by the savage: Nearly all the actions which we now call right-handed were in primeval times to him unknown. This is especially true of three things. Knives and forks have only been used in eating for a few hundred years. He ate with his fingers, and one may suspect he used the left as much as the right in this way. The Mussulman custom and its reason are, of course, both modern. Secondly, the modern gun and revolver had not been devised. The bow and arrow, the spear, boomerang, club, etc., could be used as well with the left hand by the sinistromanual. Thirdly, writing was unknown, or relatively so, and, as we have now learned, that locates the speech center in the cerebral hemisphere opposite the writing hand. It is thus evident that dextrality in the savage, at the time when it began to become habitual, must have been at best only partial, incomplete, and for a very few acts. The left-handed arrow-chippers, basket-weavers, club-wielders, sewing-women, etc., even if more numerous relatively than in civilized life, would perhaps attract little or at least less attention than now, and would be less discouraged, surely less taught to reverse the natural inclination.

In default of systematic banding and military training, also, the left-handed spearmen, bowmen, swordsmen and clubmen might not have much attention directed to themselves and sometimes might have an

advantage over their single and dextral adversaries, *e. g.*, in tilting. The preference in heraldry for dextral quarterings, etc., is by no means uniform.

But there was one overlooked factor which was doubtless decisive in setting up the trend toward dextrality. This was the development of sign-language synchronously, and even preceding that of spoken language. The ineffaceable relics of this long and arduous period exist in present day language, plainly in many savage tribes and customs, but the most striking proof is displayed in our so-called Roman numerals. The fingers of the hand held up, or counted off, were beyond question the beginnings of arithmetic, the means of barter, the method of stating the fundamental fact of number requisite in all thinking and doing. Military and intertribal dealings, especially made the custom powerful and even sacred. One finger was the origin of our figure *one*, the second equaling *two*, etc., up to five, or V, which fork was made by the thumb stuck up opposite the first I. When the counting was more than five, the other hand was made to represent the first five, the digits being added up to ten, when two forks were used, or the crossed thumbs, which constituted X, or ten.¹ The impressive cere-

¹ It does not matter with which hand the first numbering, in some cases, was done; the intelligent attention must have been directed to the action with the dextral or spear side. Homer and the earliest Greek vases show the right was *δόνει ἐπὶ*, the spear side, and *ἐπ' ἀσπίδα* the shield side.

monies of warring and bartering tribes would stamp with distinctive approval the hand used in the sign-language, and henceforth it would become the honored one, the stamping and writing hand, and in time the sword-hand. The right was chosen as the sign and numbering hand because the left was naturally used for the highly important task of guarding the sinistrally-placed heart with the shield. War is the substance of all early history and of the savage æons which preceded all history. Dr. Flint (*The Sun*, April 17, 1904) says that deaf-mutes may have an aphasia that prevents the use of the right hand in the sign-language.

Speech is the sole example of the higher functions, sensational or motor, which is single. Feet, legs, arms, hands, vision, hearing, all are dual in nature, requiring dual centers of coordination and innervation in the two halves of the brain. But speech, being a single function, can have but one center, and that, of course, must be located, not in any median place, because there is no such place, but in one or the other side. We also know by physiology and pathology that in the dextral it is in the third left frontal convolution, and in the sinistral it is in the corresponding position of the right side. We know, furthermore, that it is the intellectual act of writing, rather than the grosser acts and functions, which localizes the speech center. A man may be left-handed for everything but writing and the

judgments issuing in the correlations of spoken words are formed and innervated from Broca's convolution. Or *vice versa* in the case of the sinistromanual writer who is dextromanual for all other acts.

The reason why dextromanuality, dextrocularity, etc., must coexist with sinistrocerebrality becomes manifest. The function of speech or writing is the method whereby judgment or volition passes into action. The initial, dominating and guiding motility to vocal organs, to hand, and even to foot, springing from closely contiguous, and hence more quickly and accurately acting, cerebral centers, will be better correlated and certain than if the centers were in opposite cerebral hemispheres. The indicator of all action, the very creator of intellect, is vision. Hence all right-handed people are also right-eyed.¹ The centers for

¹One of the best tests of predominant dextrality or sinistrality is the 'sighting' of a stick to see if it is straight, or the sighting of a gun or pistol. Dextrocularity is largely a dictator of general dextrality. And of dextropedality also, for the dextral is right-footed also. Errors of judgment, however, have been frequent as to the function of the feet. The 'spade-foot' is the left, naturally, because the right leg and foot are the directing ones, in the dextral, who also, as the masonic ritual directs, steps off with the left foot first. The dextral must spring from the right foot. It has been said that the oblique line of the body of the dog in trotting is due to incipient right- or left-footedness. But all soft-footed animals avoid 'interfering' by this obliquity of progression. The much discussed knockout blow of the pugilist with the left is, I suspect, because of the better spring from the firmer right foot.

right vision, right motion, and for speech are thus in close relationship and upon the same side of the brain. As I have said (*Science*, April 8, 1904) :

“ The unification and perfection of innervation and cerebration must be better if initiated and executed with the cerebral centers mainly upon one side of the brain, than if the unity is gained by means of the longer and more distant commissural fibers extending between the two sides of the brain. In the right-handed the speech center is in the left side of the brain, as is also the motor center for the right hand, and the optical center of the right eye. The dependence of all motion upon a perfect correlation of vision and judgment needs only to be mentioned. That all intellect is psychologically the product of vision is less recognized, but is not less absolute truth. The right hand writes, possibly because the right eye looks down upon the writing more accurately than would the left; both depend upon the synchronous and closely interrelated guidance of the speech-making function. All three are in closer unity and contiguity than if either were in the opposite side of the skull.”

This furnishes the physiologic reason why all attempts at ambidexterity are failures, and unwise.

“ The chief centers most closely interrelated in writing and thinking are thus demonstrably better harmonized when in one side of the brain. The mechanics of neurology are plainly less difficult than could be achieved by any foolish and unsuccessful ambidexterity. I have never seen anything but bad results from the attempt to train children to use the right hand instead of the left, when there is a decided tendency or habit to be left-handed. Moreover, the attempt is never successful. The best consequences are poor, and are only awkward mixtures of the two forms, which yield confusions and indecisions during the entire subsequent life. I could cite many instances in

proof, some of them most pathetic, in which disease and life-failure resulted. One that plainly illustrated the neurologic troubles was that of a naturally left-handed friend, A. V. P., who by arduous and continuous training during his childhood was compelled to write with his right hand. For all other acts he is left-handed, but he cannot use his left hand for writing. Although now past fifty, he has always hated any writing, the mere act of doing so, and he cannot do any original thinking while writing. He is for this purpose compelled to rely on a stenographer, and then his ideas flow freely and rapidly. If he tries to think, plan, or devise and to write at the same time there is a positive inhibition of thought and he must make sketches, epitomes, several efforts, copyings, etc., in a painful and most unsatisfactory manner. The attempt at ambidexterity has been a lifelong obstacle to him in his professional progress. The ambidexterity of surgeons, artists, etc., is overpraised, exaggerated, and fallacious. It is of course advisable in exceptional callings and actions to cultivate skill in the more awkward hand, but that is a very different matter from 'ambidexterity.'"

All agree that perfect ambidexterity has never existed, despite all training. It is neither possible nor desirable.¹ Sinistrality is no defect and of no disadvantage. That said to exist in criminals, idiots, etc., like many things "Lombrosal," is not true, or it is *post hoc*, etc.

It seems that there is an "Ambidextral Culture Society" in England which, in default of something to do of use and in accord with nature's indications, wishes to insure that every child at school shall be so

¹ See the case of Morse, reported by Wilson; especially his own, and that cited on p. 146.

drilled in both separate and simultaneous use of the two hands that he shall have the two equally strong, sensitive and skillful. The pitiable victims! The organization might better call itself the society for nullifying the law of the differentiation of function necessary to all progress, for returning to barbarism in the handicrafts, and for life-long cruelty to the left-handed.

The essential and clarifying thought of the foregoing explanation is that as the writing act now locates the speech-center, although all other acts may be opposite-handed, so the right-hand sign-language and numbering would necessarily have had the same effect in barbarous times. That this sign-language of primitive man was dextral is not to be questioned, as about 98 percent of babies are now clearly right-handed before they are one year old. The protection of the heart by the shield would constitute sufficient reason for the institution of dextrality in counting and sign-making, and custom and uniformity of habit especially in early times, would result in almost a universality. But not an absolute one, for one or two percent are now sinistral. And the Bible story of the Benjamite tribe illustrates how the habit would not be absolute. There is in all this one noteworthy neurologic fact: In view of the long continuance and vast preponderance of dextrality it seems strange that the brain preserves all the preformed mechanisms, plastic and ready to

make a sinistral child, and the outworking of sinistrality is as prompt, the result as dextrous, as if dextrality had been chosen. The wonder at this is, however, lessened when one notes that all the functions of completed dextrality are at the same time and in the same person now possible to the sinistral; there is a mere difference in the degree not in the kind of expertness. Besides this a number of left-handed acts in the dextral, *e. g.*, those of the violinist, gunner, etc., are far more expertly and finely coordinated than those of the right, etc.¹

If the foregoing explanation of the origin and perpetuation of dextrality is adequate, it remains to explain the origin of sinistrality. Why are there about two out of a hundred naturally left-eyed and left-handed? Fundamentally, of course, because the speech-center is located in the right cerebral hemisphere, and the contributing and executing centers of vision and motion act in better unity if they are in close connection and contiguity than if connected by long commissural fibers to and from the opposite sides of the brain. The dextrocerebrality of two percent of

¹ There is thus no danger and no need of a greater weight of the half brain initiating dextrality in the dextral, and all the discussion and labor of comparative weighing the two halves is relatively useless. Moreover the cerebral mechanisms must be equally perfect even if not equally exercised. Taken in the average the two sets of organs, central and peripheral, do about the same amount of work.

sinistral exceptions to the usual law appears explainable, perhaps in part by persistence of original sinistral types, but more certainly they are due to accident, injury, disease, etc., of dextral organs, in the young of our ancestors. Especially in savage life would these accidents be more numerous than now. The loss of even one dextral finger might compel the education of the undeveloped speech center on the right side. Injury to the right hand and arm, even of the right foot or leg would do the same. Deafness of the right ear would compel a turning of the left ear forward and might work out complete sinistrality. But more important than all these causes combined would be the more frequent greater ametropia, amblyopia, disease, leukoma, etc., of the right eye, compelling the use of the left, and thus transferring all centers of dextrousness to the right side. I have repeatedly demonstrated the persistence of dextrocularity even with visual acuteness considerably less than that of the left. But there is a limit to this "accommodation," and if the amblyopia of the right is greater than double that of the left, the patient becomes left-eyed. In savage and in semicivilized life these accidents, diseases, ametropias, heterophorias and strabismuses of the right eye would again be far more numerous than in our day and civilized peoples. Our two percent of sinistral children seem for the greater part to be the descendants, by the laws of heredity, of ancestors who in childhood

and youth have been compelled to become sinistral by the causes enumerated.

Is it possible that there are proportionally more left-handed among Oriental nations who read from right to left, than in those who read from left to right? A writer in the *Cornhill Magazine* (1889) says that the change in writing whereby the proceeding from right to left was reversed was due to the use of ink and pigments in writing, and the avoidance of smearing the fresh-writing by tracing the letters from left to right. But individual writers would not do this, and, if they did, they could not get their writing accepted! It is difficult to see how there would be less smudge and smear by the reversal.¹

The arguments for upright writing are incontestably strengthened by some facts I have lately discovered as to the frequent influence of an axis of astigmatism in the dominant eye varying by about 15° from 90° , in producing a habitual canting or sideways inclination of the head. This habitual cant of the head is often followed by spinal curvature. Undoubtedly many

¹ This writer says that artists paint from left to right, that the spectator views the painting of a real landscape in the same way, etc. Even corkscrews, buckles, buttons on clothing—men's he says, not women's—are for the right-handed, and asks, *why?* The figures on the faces of our clocks and watches are traced to the same cause; but he forgot that the clock face is the modified sun-dial made round, the location of the shadow of the meridional instant line, dictating the placing of the figure 12, and of all the related ones of the day.

spinal curvatures are produced in this way, and the number of cases is much greater than is supposed. Such a patient can see upright lines, which predominate over all others in civilized life, especially in those who read much only by holding the head to one side. When the axis of astigmatism is about 75° the head must be canted to the right to see plainly. When it is 105° it must be canted to the left. Slanted handwriting is itself pathologic, or produces pathologic results of many kinds. The printed letters of the alphabet should be refashioned to avoid all lines except the vertical and horizontal. This would greatly conduce to lessening of ocular and neurologic labor, and would increase ease and celerity of reading. Almost the only letters that could not be thus remodeled and bettered are V, Z, X, which are little used. K and R also require some slanted strokes. The others could all be made up of vertical and horizontal lines. The vast majority of astigmatisms cluster about axes 90° or 180° , and those which are anomalous and unsymmetric produce disease unless corrected, as they may be by proper spectacles.

The summary of the foregoing theory of the origin of dextrality and sinistrality is:

Modern pathology has demonstrated that the intellectual acts of writing and reading locate the speech center upon the cerebral side opposite the writing hand.

The centers for vision, audition and motion of the

hand and foot for correlated dextral or sinistral actions and sensations, are in the same side of the brain.

Coordination of sensation, perception, judgment and act are rendered more accurate, expert and quick by this close contiguity and inter-relationship than if made by commissural fibers from the other cerebral hemisphere.

The original location of the speech center in the dextral was caused by the almost universal employment of the right or spear-hand in sign-language preferred to the left or shield-hand, because this was more restricted in movement by holding the shield over the heart.

The origin of left-handedness was in large measure due to the location or education of the speech center in the right brain because of the injury to dextral organs, but chiefly to disease or deficient vision of the right eye.

Ambidexterity of any general or thoroughgoing kind is neither possible nor desirable, and the attempt to bring it about results in suffering and disease.

Vertical handwriting and printed letters made up of vertical and horizontal lines, should be encouraged.

!

7

THE PATHOLOGIC RESULTS OF
DEXTROCVULARITY AND
SINISTROCVULARITY.

1

CHAPTER X.

THE PATHOLOGIC RESULTS OF DEXTROCULARITY AND SINISTROCULARITY.¹

A LITTLE observation and a few tests will show that, with some exceptions, to be noted later, the right-handed or dextromanual person is also right-eyed, or dextrocular; and the left-handed is left-eyed. That is to say, there is, in the dextromanual, the same habitual and unconscious choice of the image of the right eye for the more expert and important tasks, just as the right hand is chosen for those functions in skilled work. A dextromanual hunter places his gun against the right shoulder because he can sight it with the right better than the left eye. The right-handed person, in playing the violin, violoncello, etc., is forced to use the left hand for the more expert task, because he thus sees the fingers and the neck of the instrument without foreshortening and better than he could if the fingering were done with the right hand. All actions, in fact, are determined by the fundamental necessity

¹Read at the meeting of the American Ophthalmological Society, held in Atlantic City, July 13-14, 1904, and reprinted from its *Transactions*, and from *Ophthalmology*, October, 1904. A previous paper on the subject was published in *Science*, April 8, 1904.

that accurate vision shall precede all action, and vision is more accurate with the habitually exercised eye, just as manual function is more expert and reliable with the hand most exercised in a special kind of work.

A little closer observation soon demonstrates that not only is the dextromanual also dextrocular, but that he is likewise right-footed, and usually right-eared; he is dextropedal and dextraural. This is equivalent to saying that a person is either dextral, generally, as to ear, eye, hand and foot, or else he is sinistral. There must manifestly be a unity in the coordinations of all acts, and such coordinations would evidently be better with a habitual one-sided similarity of execution running through all kinds of action, so that there would be no indecision in rapid and dangerous acts. The unity and the resultant promptness and accuracy of all motions is thus enhanced by a synchronous dextrality or sinistrality. The mixed type, illustrated by the so-called ambidextrous, would place the organism at a wretched disadvantage in the struggle for existence, and in the social struggle of the highest types of civilized life.

The underlying and long forerunning cause, however, of the coordination of dextral acts, or of sinistral ones, lies in the necessity of the localization of the organ of speech in one or in the other side of the cerebrum. As it is a single and not a dual function, its organ can be only in one place. Pathology has

proved what physiology pointed out, that in the dextral the speech center is in the left side of the brain, and in the sinistral it is in the right side. Moreover, the intellectual act of writing develops the speech center on the side opposite to the writing hand. The history of cases with tumors and paralyses has settled this question beyond controversy.

The speech center may be looked on as the organ through which intellectual judgment and decision issues in determination and act. The spoken and written word is the most intimate act of the mind, its irrevocable and immediate exponent. Prior to all judgment and decision, vision must give the data. Intellect is, in fact, the product of vision, and all mental symbols, the letters of the alphabet themselves, are but modified visual images. The thing seen is thus worked into judgment, and by the third component of human action, motion, is wrought into completed function. Vision, judgment, act, are thus the unexceptional conditions of human activity and validity. It is at once plain that if the centers which intermediate these three functions are on one side of the brain, in contiguity, and closely united by many intercentral fibers, the resultant act will be more accurate and rapid than if one or two of the centers are in the opposite side of the brain. The commissural fibers between the two cerebral hemispheres would be fewer and longer, and the coordination less clear, sharp and certain. This is the

neurologic basis for a common dextrality or a common sinistrality of function in one individual, and it completely demolishes the foolish contention of those who would vainly educate the two percent of left-handed children to be ambidextrous. There never was an ambidextrous person, but there has been produced much misery by the foolish attempt to create ambidexterity.¹

If by ocular disease, ametropia, accident, etc., the dextromanual are compelled to be sinistrocular, the pathologic results which may flow from this interference, or reversal, of the natural order, become of exceptional interest to the ophthalmologist. That these pathologic results exist I have no doubt, and have repeatedly demonstrated in the persons of actual patients. I suspect that they exist in at least 10 percent of all patients, and no case whatever can be treated wholly irrespective of the fact of dextrocular or sinistrocular function.

For purposes of naming and clarifying the ideas to be presented, let us call the right eye of right-handed persons, and the left eye of left-handed persons, the dominant eye. The caution must be emphasized that the hand which does the writing unconsciously or preferentially dictates the location of the speech center,

¹ This subject is treated more extensively in an article published in *Popular Science Monthly*, August, 1904.

and the true condition of dextromanuality or sinistro-manuality.

It hardly needs the saying that the accidents of ocular diseases, keratitis, fundus lesions, cataract, high ametropia, heterophoria, amblyopia, etc., may put out of function, or threaten to do so, the primary—that is, the naturally, logically and neurologically—dominant eye, and thus the eye of the other side must be used as a makeshift and educated to become the secondarily dominant one. The older the age at which this occurs the greater the difficulty, the more of a tragedy will it be to the patient. There arise a hundred problems. I shall here allude, and most briefly, to but a few of these:

1. In all operative procedures there should be an exceptional striving to save the dominant eye. I do not believe in operations for this purpose, but if only one eye can be straightened and made functional in strabismus, by all odds let it be the dominant one. The strabismus of a naturally dominant eye will be more easily cured than that of the non-dominant one. In double convergent squint the dominant eye should be the one first chosen to save. In certain cases of cataract extraction a similar rule should be followed.

2. In inflammatory diseases there should be the same solicitude, when choice, as frequently, is possible, to preserve the best function in the dominant eye.

3. The supreme value of the dominant eye makes it

highly important that ametropia shall be corrected at the earliest day and year possible. Every month that amblyopia, heterophoria or strabismus increases in that eye, makes the life history and struggle of that child a different and a more difficult one. Dextromanuality, or its opposite, is pronounced in children of less than a year, and the location of the speech center is being fixed rapidly, and often unchangeably, at two and three years of age.

4. If saving of the naturally dominant eye is impossible in the young child, and its fellow must be secondarily educated into dominancy, it becomes a question if the child should not also be taught to write, eat, etc., with the corresponding hand.

5. In the adult the dominant eye I have found will preserve its dominancy despite a considerably higher degree of amblyopia, ametropia, etc., than that of its fellow. But it is evident that there must be a limit. I doubt if the naturally dominant eye would retain its dominancy if it had, say, an acuteness of only 20/50 while the vision of the other was normal. This fact arouses a number of queries in the mind of the refractonist. One of these would refer to the inadvisability of giving the non-dominant eye a greatly superior acuteness of vision by means of glasses. In an adult such a sudden change, even reversal, in the habits of part of a lifetime might be brought about that the spectacles would not be tolerated, and failures of varied

kinds ensue. The patient would then have a life handicap that would greatly lessen his personal validity and happiness.

6. An axis of astigmatism in the dominant eye from 10° to 20° to either side of 90° or 180° , while the axis in the fellow eye remains normal or unsymmetric, produces head-tilting; symmetric axes produce no head-tilting. In the few months after I discovered this law I found in the ordinary run of office practice over thirty cases of head-tilting. The stupid error I had made all my life was to allow these patients to cant the head during the refraction testing. In this way I had failed to find how large is the number of right-handed patients who have axes of astigmatism of the right eye from 10° to 20° to one side of 90° or 180° . And never before this had I thought of the necessity of inquiring as to dextromanuality in patients having these slightly unsymmetric axes of astigmatism. It is evident that an axis in the dominant eye only 5° to one side of 90° or 180° would hardly produce a noticeable tilt of the head, or might possibly be compensated for by the rotation of the eyeball itself. It is possible that some types of heterophoria, and especially cyclophoria, may be explained as arising from this compensation of the ocular structures instead of producing the tilt or cant of the head. It also seems possible that this compensatory twist of the eyeball in the orbit may possibly cause a compensatory twist of the optic nerve,

and perhaps certain other diseases of the papilla and retina. After prescription of proper correcting glasses it would be natural to find before long a secondary change of axis resulting from the rectification of the abnormal head tilt, or ocular twist. Such patients must be kept under continuous and repeated observation.

If the axis of astigmatism of the dominant eye is about 75° or 165° , it is evident that, if the non-dominant eye is unsymmetric, the head must be tilted to the right in order to bring the false axis into line with the vertical lines of print, trees, houses, wall paper, doors, etc.

If the axis of astigmatism of the dominant eye is about 105° or 15° , compensatory tilt of the head must be to the left. Greater variations of the axis than 20° would hardly be compensated for by head-tilting, but would either produce amblyopia, a transfer of dominance to the other eye, or else some other pathologic consequence equally harmful to action and life. The axis of the largest number of head-tilters is 75° in the right eye, and thus the majority tilt the head to the right.

7. Among the thirty or more head-tilters I have found, in the few months mentioned, about a dozen with resultant spinal curvature or scoliosis. The fact was usually unsuspected by the patient, the parent and the attending general physician. I sometimes had

difficulty in getting consent that an expert orthopedic surgeon should verify the diagnosis. A report of these cases, the nature of the compensatory spinal curvature, and the cure by glasses alone, or by glasses and orthopedic help, will be published later. It is needless to add that the method of production of scoliosis resulting from an enforced and habitual abnormal position of the head is well understood by orthopedic surgeons. Habitual carrying forward, for instance, of the hearing ear in case of unilateral deafness will result in scoliosis. There are undoubtedly thousands of children with curved spinal columns in the United States whose spinal disease is due to a slightly aberrant axis of astigmatism.

8. An ametropia in the non-dominant eye which tends to throw it out of function is much more likely to result in malfunction, non-function and disease of that eye than would be the case in the dominant eye. Many practical suggestions and rules result from this fact both in refraction work and in the management of inflammatory diseases. In amblyopiatrics, for instance, it is perhaps as well not to strive to give the non-dominant eye an exceptional, or even an equal, acuteness of vision. Nature will not respond to the attempt so willingly as in a similar attempt with the dominant eye.

9. The failure to diagnose the unsymmetric variation of axis of the dominant eye will, of course, result

in the non-cure of the reflexes which are caused by eyestrain. This is so well established that it may serve as a reason for reexamination of the cases in which, in the past, there has not been perfect relief of patients with general ill-health, migraine, dyspepsia, headache, neurasthenia, insomnia, melancholy, etc., probably due to eyestrain. Not seldom the change of axis found to exist when the refraction test is made with the head accurately erect will at once bring astonishing and brilliant relief in many forms of inveterate systemic functional disease.¹

POSTSCRIPT.

After the foregoing paper had been read at Atlantic City, Dr. Peter N. Callan said to me that the suggestion of right-eyedness had also come to him, and he had asked the question in the *Medical Record* of April

¹ A corollary of the discovery of the cause of so many cases of tilted heads is suggested. Beside the thousand vertical and horizontal objects that demand relief of astigmatism, or its placing at axes 90° or 180°, the predominant cause in civilization is the shape of the letters of the printed page. As a rule, these are made up chiefly of lines at axis 90°, supplemented by a few at 180°, and a less number of curves and of oblique axes, at about 60° or 70°, or, conversely, at 120° or 130°. It is these last which should be eliminated when it is possible, and in all but a few letters this is possible, the exceptions (K, V, X, Z) being relatively unimportant. The lower case of small letters could be modified in shape to correspond to these. The lesson as to vertical and slanted handwriting at school is equally plain.

2, 1881. Confirmation of the fact has been found in the examination of the records of more than 1,000 of the private patients of Dr. H. D. Noyes in whom each eye had been carefully examined and the vision and refraction noted. The general results were that when myopia existed there was a higher degree in the right than in the left eye, and when hyperopia was present there was a less degree in the right than in the left. In the hyperopic cases the vision was more acute in the right than in the left, and in the myopic the vision was almost the same in each eye, taking all degrees into consideration. Dr. Callan drew the conclusion "that with binocular vision we use one eye more than its fellow—that one being generally the right eye." This quick confirmation of the theory of dextrocularity was unexpected, and suggests a number of valuable and practical rules in refraction work, in the care of the eyes of school children, students, etc.

There are indirectly further proofs of the theory to be found in the ingenious and instructive paper of Dr. Wheelock Rider, on "Unilateral Winking," published in *Transactions of the American Ophthalmological Society*, 1898, to which my attention was kindly directed by the author, in the discussion of my paper, and which had also escaped my notice.

1

1

SUBNORMAL ACCOMMODATION
AND PREMATURE
PRESBYOPIA.

CHAPTER XI.

SUBNORMAL ACCOMMODATION AND PREMATURE PRESBYOPIA.¹

At least 99 percent of "migraine" is caused by eyestrain and smaller percentages of other types of headache, dyspepsia, malnutrition, etc. Many nervous and psychic disorders have the same origin, and the majority of cases of "idiopathic" lateral spinal curvature. When due to eyestrain, the failure to cure these troubles by ocular treatment is either due to the failure in preventing them by the same treatment, to the fact that the individual case is not chargeable to eyestrain or to the oculist's fault. We are constantly and rapidly learning that our faults as refractionists explain our failures to cure. There is a vast realm of unsolved puzzles and mysteries in ophthalmic practice, but every advance we make shows that it was to our ignorance or carelessness that we should ascribe most of our failures. It is astonishing to perceive upon what slight and seemingly negligible things success depends. A whole art and science of therapeutics is being built up upon these nothings, heretofore and even now, generally neglected by the great body of oculists and physi-

¹ From *American Medicine*, Vol. IX., No. 3, pages 103-108, January 21, 1905.

cians of the world. That, of course, is the history of discovery and progress in every branch of knowledge. We pass at our peril the tiny thing, the trivial consideration, fact, or suggestion, upon which all great things depend.

A good, round three-fourths of our failures as oculists are due to our poor refraction work. In all Continental Europe it is a disgraceful farce, with the possible exception of that of one or two men. In England two or three men are doing work equal to that of a hundred in America. But it is simply amazing to find men in our own country who are "leading oculists" in their communities and members of great ophthalmologic societies, utterly ignoring the conditions of accurate ametropia measurement, spurning cycloplegiacs, disdaining astigmatism and anisometropia, and, of course, heaping ridicule upon the "hobby-rider."

Of the remaining fourth of our failure to cure eye-strain diseases, a large proportion is due to neglect of head-tilting, with the result that we do not locate accurately the slight unsymmetric axes of astigmatism. The ordinary and common symptoms, such as headache, gastric, nutritional, and nervous disorders, are consequently not relieved, and one of the great causes of spinal curvature is not discovered or prevented.

Many of our puzzling nonsuccesses are due to failure to recognize insufficient or paretic accommodation, or

premature presbyopia. The books do not know of it, and the lecturers do not speak of it. Such case are peculiarly tormenting, because the symptoms are plainly those caused by eyestrain, which the perplexed and desperate oculist cannot lessen. There is no test by which the fact may be learned, because for the time required in the ordinary tests there is almost always the ability to hold the vision perfect, or seemingly so, by an effort which exhausts with long-continued reading, writing and sewing. Then the cases are so rare that the hundred normal accommodations following the last example of the abnormality make the oculist careless and likely to forget. Failure and ill-success is the penalty of routine. Moreover, the paresis of accommodation may occur in the most unlikely people, and as it is so peculiar, masked and variable, it requires great alertness and conscientiousness to keep the danger in mind. But when subnormal accommodation in the young does exist, it means so much to the patient, and to the oculist also, to become aware of it! The relief by glasses is usually great, instantaneous, almost magical. Most of the twenty-seven patients whose clinical histories are here epitomized had been treated by many other oculists, and all had failed to find the source of the evil. This makes me feel that, like myself, most of my colleagues have not recognized this pathogenic factor in a certain number of their patients. Some of these case histories date back from

six to fourteen years, but the fact of accommodational paresis has become clear to me only during the last few years. I have no doubt that I have missed recognizing it many times even during this time.

This is because we have neglected to notice that the function of accommodation is the only important one of the male human being that gives out in middle and advanced life, a fact that demonstrates biologically the recentness and difficulty of its acquirement, the temporariness of its easy action, and consequently the variableness of its quality or power in heredity and exercise. The lens is its organ, and all depends upon the endowment and preservation of its inherent elasticity or refracting power. The ciliary muscle does not lose its power, and hence the strain of effort of this muscle acting upon a paretic or subnormally elastic lens makes all the greater the reflexes of eyestrain. Without nervous connection with the brain and body, nourished only by blood-serum without blood-corpuscles, it is not surprising that the lens loses its elasticity, and thus gives the refractionist added and difficult problems. But with their solution the explanation is guaranteed of many of our most distressing failures to cure, and the opprobrium of our inability to relieve many diseases and cases is removed. The critics and ignorers of "the eyestrain hobby-rider," as they care more for the preservation of their prejudices than they do for the relief of the sufferings of their patients,

will not at once welcome this new power in therapeutics. This, of course, will not long postpone the recognition of the fact.

Case 476 offers an interesting example of the ever-varying conditions of accommodation anomalies. A man at the present time 46 years old has a static error of:

R. — Sph. 0.25 + Cyl. 1.00 ax. 115° = 20/20

L. + Cyl. 1.00 ax. 75° = 20/20

But for distance he has an accommodation so strong that — Sph. 1.00 is required to give him normal distant acuteness. Even — Sph. 0.50 added to his static correction will give him only about 20/40 vision, and this is annoying. But he also presents the contradiction of insufficient accommodation for near, and + Sph. 1.75 must be added to his distance glasses, in bifocals, to enable him to read without intense pain in the neck, a sore and swollen spot on the occipital bone, insomnia, etc. I have tried for years to reduce the accommodation power for distance, but without great success.

Case 626 is that of a young woman who came to me soon after I entered upon practice, and who long had more faith in me than I had understanding of her disease. She had almost every symptom which has been charged to eyestrain and hysteria, but I preserve a clear conviction that few or none of her troubles were imaginary, and that if I had known what I discovered years later, I might have lessened her sufferings, if not cured them entirely. For about seven years, during which she clung to me with pathetic trust, I tried everything, ocular and systemic, to give her relief, but succeeded only for a little while or but partially. At last it entered my head that although she saw clearly at near range with her distance correction, she might need more help of a paretic accommodation, and rapid increases were made in her near lenses, until, at the age of 37, she is now wearing + Sph. 1.50 D. as presbyopic segments in

bifocal glasses, and with a satisfaction and freedom from sufferings, which she has never before experienced. Her static error is:

$$\begin{aligned} \text{R.} + \text{Sph. } 2.75 + \text{Cyl. } 1.50 \text{ ax. } 45^\circ &= 20/60 \\ \text{L.} + \text{Sph. } 0.37 + \text{Cyl. } 1.25 \text{ ax. } 180^\circ &= 20/30 \end{aligned}$$

The amblyopia has improved somewhat, but a high exophoria has wholly disappeared, and there is now almost perfect muscle-balance.

Case 1958 is that of a woman now 38, whom I failed to give perfect relief for several years. Her static error was:

$$\begin{aligned} \text{R.} + \text{Sph. } 3.25 + \text{Cyl. } 0.50 \text{ ax. } 75^\circ &= 20/20 \\ \text{L.} + \text{Sph. } 2.50 + \text{Cyl. } 0.37 \text{ ax. } 105^\circ &= 20/20 \end{aligned}$$

After a time complaints and experiments led me to order bifocal spectacles:

$$\begin{aligned} \text{R.} + \text{Sph. } 3.37 + \text{Cyl. } 0.50 \text{ ax. } 75^\circ & \left. \vphantom{\begin{array}{l} \text{R.} + \text{Sph. } 3.37 + \text{Cyl. } 0.50 \text{ ax. } 75^\circ \\ \text{L.} + \text{Sph. } 2.62 + \text{Cyl. } 0.37 \text{ ax. } 105^\circ \end{array}} \right\} \text{Distance} \\ \text{L.} + \text{Sph. } 2.62 + \text{Cyl. } 0.37 \text{ ax. } 105^\circ & \\ \text{R.} + \text{Sph. } 4.00 \text{ and Cyl. } & \left. \vphantom{\begin{array}{l} \text{R.} + \text{Sph. } 4.00 \text{ and Cyl. } \\ \text{L.} + \text{Sph. } 3.25 \text{ and Cyl. } \end{array}} \right\} \text{Near} \\ \text{L.} + \text{Sph. } 3.25 \text{ and Cyl. } & \end{aligned}$$

The small degree of premature presbyopia or accommodation failure could not be discovered by any tests, and only the experiment brought the fact to light.

Case 3417 is that of a young woman of 20 years of age, in 1894, who gave me at that time a history of severe sick-headaches, the crises recurring every two weeks for the last twelve years. There was a leukomatous cornea in the right eye from keratitis as a child. I found her static refraction:

$$\begin{aligned} \text{R.} + \text{Cyl. } 3.00 \text{ ax. } 180^\circ &= 20/100 + \\ \text{L.} + \text{Sph. } 0.62 + \text{Cyl. } 0.50 \text{ ax. } 90^\circ &= 20/20? \\ &\text{with } 14^\circ \text{ of exophoria.} \end{aligned}$$

I ordered the best correction I could give, and did not see her again until 1901, when I again refracted her eyes and gave her somewhat different lenses. The sick-headaches had been, in part, replaced during these years by a severe pain in the left side of the chest, extending to the left arm, brought on by reading, writing, or sewing, even for a few minutes. This compelled her to give up her position as a school teacher. In 1903 I again retested her eyes. She reported that during the last two years reading any length of time would cause pain under the left shoulder-blade, extending to the breast, to the base of the brain and down the left arm to the middle fingers. Thinking the struggle of the maimed right eye to retain its share in binocular vision might be the cause of her eyestrain reflexes, I asked her to try the use of a blinder over the right eye when reading. She reported in six weeks that she could not do this. There was no relief from the device. The sick-headache, however, had been better of late and more rare, although they still clung to her, as they had done more or less during the years since I first saw her. She is now entirely relieved of the peculiar, indescribable and unendurable suffering which used to accompany the attacks, and the pain in her arm and side is not so intense, and she can use the arm more in sewing. In 1904 I had learned my lesson as to subnormal accommodation, and was not thrown off my guard so easily by the leukoma of the cornea of the right eye. I now found her refraction error to be:

R. + Sph. 0.62 + Cyl. 3.00 ax. 180° = 20/50?

L. + Sph. 1.12 + Cyl. 0.25 ax. 180° = 20/20

But there was exophoria of 15°, and hyperphoria of 15°, showing, of course, the complete loss of binocular fusion. Then came to light the reason of my failure to give her complete relief during all these years and the reason for the partial functional exclusion of the right eye, by means of the enormous heterophoria. (But the doubling of visual acuity proved the

benefit of the glass.) This was a failure of accommodation power measured, in the right, by + Sph. 1.62, and in the left by 1.00. The difference in the loss is highly suggestive. Bifocal glasses were ordered and the last report was gratifying.

Case 3812 is that of a woman who, when she came to me in 1895, was 35 years of age; her static error was:

R. + Sph. 1.62 + Cyl. 0.37 ax. 45° = 20/20

L. + Sph. 1.50 + Cyl. 0.25 ax. 45° = 20/20

For nine months she was relieved entirely of her headaches and other reflex symptoms, but with their recurrence, I found little or no change to account for them. I gave a stronger correction for near-work, but in two months there was still trouble. The symptoms were surely due to eyestrain, and I had failed to give relief. There was but one recourse. She could temporarily overcome the weakness and see to read plainly, or at least she contended that she could do so. By experiments I found that there was an accommodational weakness, measured by + Sph. 2.75 over her distance correction. With this, in bifocals, all the symptoms disappeared in a day, and have never returned. The woman had been a great sufferer all her life—was, in fact, an invalid under the care of many physicians and oculists. She now has good health.

Case 4144.—For several years prior to 1902 I had been able to give this patient, aged 40 at that time, fairly good satisfaction by her distant correction worn all the time. Complaints now became insistent. She had but one useful eye, the left, the right having become practically blind from strabismus, unsuccessful operation and disuse. The left required + Cyl. 0.50 ax. 90° to give her perfect acuteness of vision. Her symptoms were plainly due to eyestrain, and the solution only came when I found premature presbyopia, which was neutralized by + Sph. 1.37 added to her cylinder. In 1904, at the age of 42, this loss of accommodation power is measured by + Sph. 2.25 D.

Case 4748.—This patient is a woman, now 39 years of age, who for many years has done an enormous amount of reading and writing. I had during several years prescribed glasses for constant use, but although she was generally physically strong and healthy, they were never satisfactory. Her static defect was the same in both eyes, $+ \text{Sph. } 0.75 + \text{C. } 0.25 \text{ ax. } 90^\circ$, with perfect vision. She had had conjunctival hemorrhages after severe study, photophobia, pain and burning in the eyes, asthenopia and headache. After a term of abuse of the eyes, she had an attack of hemiplegia, the right side of the body being without power or sensation. The right pupil was contracted to a pin-point, the left widely dilated and responding but little to light. Rest in bed and cessation of all reading were followed by a return to normal, the hemiplegia disappearing entirely. This was seven years ago, and there has been no return of such symptoms. Two years later there was an attack of herpetic conjunctivitis, photophobia, and pain in the temples. The axes of astigmatism were now found to be 70° and 110° . Now began attacks of typical migraine, followed by intense dermatitis. These I did not at first dream were connected with eyestrain, because, like the rest of the profession, I had never known or had forgotten what the science of 100 years ago had clearly recognized. The old clinicians, of course, had no idea that migraine was due to eyestrain, but they saw that "herpetisms" were not seldom the sequels of migraine. Wagner's was a clear case of eyestrain, and he had repeated attacks of a "cutaneous malady" and "continuous attacks of erysipelas," which tormented him much of his life. My patient had most distressing attacks of "hives" and various other eruptions, pronounced by the best dermatologists atypic, and which were puzzling to them and intractable. These attacks were sometimes called acute urticaria, psoriasis, generalized eczema, pityriasis rosacea, etc. In looking back over her life, this very intelligent patient now remembers that the eruptions were always connected with extreme use of the eyes, headache, and especially sick-headache. All of these symptoms in her case have since

been repeatedly demonstrated to be due to eyestrain. They recur with leaving off the glasses, and are relieved at once by proper correction of the eye defect. A most carefully observed and excellently reported case of a similar nature has been called to my attention. It was in the practice of Dr. Charles A. Oliver, and published in *The Philadelphia Medical Journal*. The repeated demonstrations that the urticaria was absolutely caused by eyestrain is most convincing. Observations would doubtless prove the sequel more frequent than is supposed. Other cases which I had seen of these skin affections connected with migraine and the growing conviction that migraine itself is entirely a product of eyestrain finally landed me in the puzzle that here was a patient of 38 with an almost inconsiderable error of refraction, and yet with the most glaring diseases due to eyestrain. The solution of the mystery came with the thought of premature presbyopia, and the enormous amount of reading and writing done by the woman. A moderate amount of near-work left her free from attacks; with 10 or 15 hours a day of application there was the sick-headache and the terrible eruptions all over the body, which confined her to bed or the bath-tub for a week or two at a time. There was not the least sign of recession of the near-point, and reading produced no trouble if not exceeding several hours a day. At first I gave her reading glasses + Sph. 0.62 stronger than her distant correction. These gave complete relief except when they were forgotten for two days, followed by a typical attack of migraine and urticaria, subsiding in twenty-four hours after the reading glasses were resumed. With a still stronger correction (1.25), and put in bifocals and worn all the time, this woman, now 39 years old, has had no attacks unless the glasses are broken or forgotten.

Case 5489 is that of a woman of 23 with a static error as follows:

R. + Sph. 2.50 + Cyl. 1.00. ax. 90° = 20/20

L. + Sph. 3.50 + Cyl. 0.75 ax. 90° + 20/20

She had suffered much from frontal headache, asthenopia and indigestion. There was at first a high accommodation power and a low correction was followed by some relief, but a speedy return of headache, sleepiness, etc., and also by a dental reflex symptom somewhat more frequent than is suspected. Intense neuralgia came on in the jaw and teeth of one side. The teeth were demonstrated sound and healthy. One tooth finally became the seat of the toothache. The tooth was killed. The pain at once transferred itself to the corresponding tooth on the opposite side. The nerve was likewise killed in this tooth by the obliging dentist. Another tooth seemed to die spontaneously. There was now another visit to my office and I found the accommodation reduced to normal, but with my former low correction there was, of course, much eyestrain with continuous near-work. Full correction for reading, writing and sewing brought considerable but not complete relief, and at the last visit one diopter added to the distance glasses for near-work has brought entire satisfaction. She is now 29; if there is a return of the symptoms I shall advise bifocals.

Case 6316 is that of a woman of 35, whose static error is:

R. — Sph. 2.50 — Cyl. 0.50 ax. 50° = 20/20
 L. — Cyl. 0.25 ax. 140° = 20/20
 with an exophoria of about 20° .

She had passed through the hands of able oculists, but they had failed to notice that in such a defect the right eye would be used only for near-work, and the left only for distance, and that this would necessarily destroy the accommodation of both eyes. Their glasses, ordered only for distance or constant use, would naturally increase the patient's difficulties and symptoms instead of relieve them. By prescribing:

Distance $\left\{ \begin{array}{l} \text{R. — Sph. 2.50 — Cyl. 0.50 ax. } 50^{\circ} \\ \text{L. — Cyl. 0.25 ax. } 140^{\circ} \end{array} \right.$

$$\text{Reading } \left\{ \begin{array}{l} \text{R. — Cyl. 0.50 ax. } 50^{\circ} \\ \text{L. + Sph. 2.00 — Cyl. 0.25 ax. } 140^{\circ} \end{array} \right.$$

this patient's problem was solved and binocular vision established.

Case 6324 is that of a woman of 39, complaining four years ago of frontal and occipital headache, sleepiness on use of the eyes for near-work. At that time I was not aware of the fact that subnormal accommodation might be the explanation of my failure to relieve symptoms by the use of the ametropic correction alone. Here was a woman with a low degree regular compound hyperopic astigmatism (B. E. + Sph. 0.62 + Cyl. 0.50 ax. 90°), and who got little relief from evident eyestrain by the glasses ordered. For a year I tried all methods, general examination, urinalyses, with indicated hygienic and systemic therapeutics—all in vain. The woman was doing a great deal of writing and reading, and was finally compelled to give up her position, and take another with less pay and work. She returned to me recently, after an absence of two years and a half. She had a severe headache or neuralgia, a few weeks ago, above the eyes, and was abed several days, the pain so intense that morphin was given. She has long recognized that her symptoms are caused by the use of the eyes. I had now learned my lesson, and at this visit I recognized that the symptoms indicated premature presbyopia. Her static refraction I found to be:

$$\begin{array}{l} \text{R. + Sph. 1.00 + Cyl. 0.62 ax. } 90^{\circ} = 20/40? \\ \text{L. + Sph. 0.87 + Cyl. 0.62 ax. } 90^{\circ} = 20/20 \end{array}$$

When the mydriatic wore off I found the subnormality of accommodation I had expected and ordered:

$$\left. \begin{array}{l} \text{R. + S. 0.75 + Cyl. 0.62 ax. } 90^{\circ} \\ \text{L. + S. 0.62 + Cyl. 0.62 ax. } 90^{\circ} \end{array} \right\} \text{Distance} \quad \left. \begin{array}{l} \text{R. + S. 2.25 and Cyl. } \\ \text{L. + S. 2.12 and Cyl. } \end{array} \right\} \text{Reading} \quad \left. \begin{array}{l} \text{Distance} \\ \text{Reading} \end{array} \right\} \text{Bifocals}$$

There has not been sufficient time since to give the results of this correction, but I have little doubt that they will be good. The amblyopia in the right eye had not bettered in four years, a natural consequence of the noncorrection of the accommodation weakness. I am curious to see if it will not now improve somewhat, despite her age.

Case 7005.—This patient, a woman of 32, had had temporary and partial relief of her headaches and sick-headaches for eleven years by the glasses of other oculists. Recently the appetite had grown bad. She had quite a high degree of compound hyperopic astigmatism with perfect acuity of vision. For eighteen months I also was able to give her considerable comfort, but in November, 1904, there was much nausea, ill-health and "nervousness." I again changed her glasses, finding a decided increase of astigmatism in one eye. I ordered:

R. + Sph. 1.25 + Cyl. 1.62 ax. 90°
L. + Sph. 1.37 + Cyl. 0.50 ax. 90°

There was again a temporary and noticeable bettering, but in reading, writing, etc., the symptoms tended to recur. I ordered for near-work:

R. + Sph. 1.87 and Cyl.
L. + Sph. 2.00 and Cyl.

and success was attained.

Case 7127 is that of a man of 42, with a static correction of:

R. + Sph. 0.87 + Cyl. 0.37 ax. $90^{\circ} = 20/30$
L. + Sph. 1.00 + Cyl. 0.87 ax. $180^{\circ} = 20/30$
and without muscular imbalance.

I gave him weak presbyopic segments in bifocals, but he was soon dissatisfied with them, and I was puzzled to understand why until I found he was depressing his head and reading at a great and abnormal distance through the upper or dis-

tance lenses. At the same time I discovered that my presbyopic correction was entirely too weak to allow him to read at the proper distance and for but a little while. I increased this correction first to 1.25 D., and soon was forced to carry it to 2.00 D. added to his distance lenses. During his early life the reversed astigmatism without correction could not be overcome, and the accommodation was thus highly parietic from disuse, and the odd compensation plan became habitual of reading and writing almost at arm's length.

Case 7353 is that of a busy physician, aged 27. All the glasses that had been ordered for him before he came to me gave at best only temporary and partial relief. Thirty minutes' reading would bring on a headache and if persisted in there would be sick-headache, indescribable suffering and depression. He was sick in bed, three years ago, for a week with "congestion of the retina." His static error was found to be:

$$R. + \text{Sph. } 1.00 + \text{Cyl. } 1.00 \text{ ax. } 80^{\circ} = 20/20$$

$$L. + \text{Sph. } 3.50 + \text{Cyl. } 0.62 \text{ ax. } 115^{\circ} = 20/20$$

His adduction power was only equal to the abduction; I gave him 64° of adduction power by prism gymnastics, with some relief and added reading ability, but neither this nor my correction of his refraction error gave him ability to study or read long, and the muscle imbalance was highly variable. He persistently tilts his head to the right, but has no spinal curvature. I at last discovered subnormal accommodation, and gave him glasses for near-use, stronger by 1.00 D. than his static correction. He discovered that his symptoms were lessened, and without any decrease of distant visual acuteness, by wearing these all the time. This led me to strengthen his reading correction, the total being as follows:

$$R. + \text{Sph. } 2.50 + \text{Cyl. } 1.12 \text{ ax. } 80^{\circ}$$

$$L. + \text{Sph. } 5.25 + \text{Cyl. } 0.37 \text{ ax. } 105^{\circ}$$

But there still remained the inability to read as he desired without bringing on suffering, and the demands of his life are that he shall keep posted in medical literature and progress. At last I learned that during childhood a table fell and struck him on the forehead, cutting the scalp open the entire width of the forehead and also vertically into the hair on one side. One cannot know what results may have been caused by such an extensive injury. Two things lead one to suspect that there was cerebral or meningeal traumatism and inflammation: He has always been somnambulistic, walking all about the house, talking and doing strange things in his sleep; he also has a persistent subnormal temperature, ranging from 96° to nearly normal, but never over 98.4° , generally about 97° . His case is as much a puzzle to neurologists as it is to me, and I am not at all sure how far his eyes have been the cause of his troubles, or if his subnormal accommodation is the consequence of the traumatism. It is certain that his anisometropia and intense eyestrain during youth and college days would work havoc with any nervous system, but that does not imply that the head injury has not been at least a contributing cause of the man's misfortune.

Case 7530 is that of a woman of 38, wearing atrocious optician's glasses, with much epiphoria, some frontal and temporal headache, constipation, "nervousness," or restlessness, irritability, excitability, depression of spirits and dizziness. Her static error is:

Both eyes + Sph. 6.50 + C. 0.50 ax. $90^{\circ} = 20/60$
and some exophoria.

This huge error, of course, was not to be overcome; there had been renunciation of the attempt, with almost complete resultant lack of accommodation power. She subsequently required full correction for distance, and 2.50 D. added for near in bifocals, with perfect relief of all her symptoms and a great improvement, in six months, of visual acuteness.

Case 7554 is that of a man of 27, who has worn incorrect glasses since the age of 13. He works for twelve hours a day by artificial light at reading and writing. His eyes tire, and he has a feeling as if they were turning toward the nose, and "as if being pulled back in his head." There is temporal headache and pain in the eyes. He does not feel rested after the night's sleep. He has nausea when feeling the worst. He is very depressed and "nervous." He was wearing:

R. + Sph. 1.75 — Cyl. 3.50 ax. 15°
 L. + Sph. 1.75 — Cyl. 3.50 ax. 165°

His static refraction is:

R. + Sph. 1.25 — Cyl. 5.00 ax. $5^{\circ} = 20/20?$
 L. + Sph. 2.00 — Cyl. 4.75 ax. $160^{\circ} = 20/40$

Although only 27, I found that his correction for distance did not give him clear near vision, and I ordered + Sph. 1.75 as presbyopic segments in bifocal glasses. But this did not give relief, and two months later I increased the power of the segments to 2.25 D., when there was a disappearance of the symptoms mentioned. He returned in six weeks with slight complaints, when I discovered plain evidences of an increase of accommodation power, and I at once gave him comfort by a reduction of the segments to 1.25 D. In two weeks more his accommodation power had become normal, and the distance glasses (remaining all the time as originally ordered), are now worn with satisfaction for all purposes.

It seems from this history that the accommodation paresis was probably due to a direct inhibition reflex.

Case 7575 is that of a woman of 50 whose left eye has been practically blind from childhood. The static refraction of the right is + Sph. 1.75 + Cyl. 0.50 ax. 30° . She was wearing a cylinder axis 90° . She had been a great sufferer from sick-headache, car-sickness, etc., up to four years ago when glasses

gave her relief. Her chief complaints now are pain in the temple, extending over the head, "congestive stomach trouble," eructations and constipation. I found almost total paralysis of the accommodation, and ordered:

R. + Sph. 1.75 + Cyl. 0.50 ax. 30°	} Distance
L. Plano	
R. + Sph. 4.12 and Cyl.	} Reading
L. Plano	

She has now none of the symptoms complained of, is healthy and most grateful.

Case 7703 is that of a woman of 29 who has suffered much from headache, the pain being throbbing and extending to the neck, and made worse by sewing. She frowns or scowls, is always sleepy, has chronic constipation, is "nervous," irritable, depressed, worries much, etc. There is complaint of lacerimation and photophobia. I ordered:

R. + Sph. 0.25 + Cyl. 0.50 ax. 90°
L. + Cyl. 0.50 ax. 90°

In six months all symptoms were better and her improved health was shown in a gain in weight of fifteen pounds, her former weight having been 115, and now 130. But her eyes tire with near-work and in one hour get "bloodshot." These symptoms were relieved by a second pair of glasses for near-work as follows:

R. + Sph. 1.62 and Cyl.
L. + Sph. 1.37 and Cyl.

Case 7716 is that of a professor in a large university, who three years ago was compelled to resign because of ill-health; since then he has been wandering over the world from one physician to another in the hope of finding relief from "nervous depression," headache, intense photophobia from artificial light (not from daylight), and an awful feeling as if the head

would burst. He had a nervous breakdown ten years ago after studying hard. Great neurologists and oculists have not been able to do him any good, or to understand his case. In 1901 the right pupil suddenly dilated with a reported paralysis of the accommodation of this eye. Pilocarpin ordered by a famous European oculist brought the pupil down to normal, but resulted in no permanent good. I found the right pupil wider than normal, but not reacting to stimulus either of light or accommodation. His static error is:

R. + Sph. 2.75 + Cyl. 2.25 ax. $45^{\circ} = 20/20?$

L. + Sph. 3.75 + Cyl. 2.25 ax. $135^{\circ} = 20/50 +$

The man is 34 years of age, but I found he demanded full correction for distance and a somewhat stronger correction for near-work, which was ordered in bifocals. At the time of his first visit he was sailing for Europe the same day, and I could not keep him under observation and for continuous testing. There was some relief following the use of these glasses, an ability to read from one to two hours daily and sometimes for quite a number of hours; but this would not be satisfying. Upon his return from Europe I found an anomalous condition of the muscular imbalance. The tests did not show any constancy of innervation, the cover tests and rod tests contradicting each other. There was sometimes an exophoria of enormous degree. There was plainly no binocular fusion. I now discovered a great weakness of the accommodation for continuous use, although by the momentary tests and those for a half-hour's reading, it was not at all detectible. And this was the secret of the man's tragedy. Moreover, there was a difference in the accommodative weakness of the two eyes, the right eye showing a greater loss of power than the left. In addition to his distance correction, I ordered in bifocals for near-work:

R. + Sph. 4.75 and Cyl. as above

L. + Sph. 5.50 and Cyl. as above

That is, 2.25 were added to the right and 1.75 to the left. In a day or two he was reading much more, and without symptoms, visual acuity had greatly improved, and at all distances under six feet there was no motion of the eyes under cover. I judge that the entire history of the man's misfortunes was caused by unrecognized accommodation weakness. The history is to be completed.

Case 7724.—A healthy actor, now 50 years of age, who has acted almost every night for some thirty years, has during the past two years been much troubled with objective vertigo, the first attack preceded by nausea. Many great physicians and specialists have pronounced him free from all organic disease, except possibly insidious brain disease. He was engaged in severe literary labor two years ago, in addition to his eyestrain from the footlights. He sometimes read all night. He has always been strong and possessed good health, never has used stimulants, not even tea or coffee, and has never had any infectious disease. Whenever he does much reading the vertigo returns. No physician has ever suggested ocular cause of his vertigo. Great oculists told him he needed no glasses and gave him an eye lotion. He was wearing optician's glasses, of course, and incorrect ones, it goes without saying. His static refraction was:

$$\begin{aligned} \text{R.} &+ \text{Cyl. } 0.25 \text{ ax. } 45^\circ = 20/20 + \\ \text{L.} &+ \text{Sph. } 0.25 + \text{Cyl. } 0.37 \text{ ax. } 60^\circ = 20/20 + \end{aligned}$$

When the effects of the mydriatic passed off I found that he had no accommodation power whatsoever. There was the complete paralysis of a man of 65 or 70 years of age. Bifocal glasses have given him perfect relief of his symptoms, but there remains a sensitiveness to long periods of reading and a tendency to pain in the back of the head. A few hours of reading at a time is all he can do; by resting, walking, etc., and doing his reading by daylight, he is very happy. He cannot work by artificial

light. In other patients who are actors or actresses I have also found this inability to endure artificial light, and the influence of the footlights to paralyze the accommodation. It is the secret of the ill-health of many actors and actresses.

Case 7847 is that of a single woman of 37 years of age in 1904. She has been a great sufferer from headache, starting in the forehead, extending to the vertex, occiput, and the pain thence going down the spine. She has occasional "bilious headaches" with vomiting and violent pain in the epigastrium. These attacks last for four days in which no food is taken or retained. The vision was extremely poor preceding the last attack. She has been greatly troubled by flatulence. She has worried much about her eyes, and keeps up a constant fight against despondency. She has terrible nightmare dreams which awaken her with fright, so that she does not sleep well at night; and yet she is drowsy and dull during much of the day. She has worn glasses, incorrect ones, for sixteen years. She was for many years an engraver on gold, using a magnifying glass for this purpose, and she can now read only by the aid of this glass. Deafness began coming on while working at gold engraving, between the ages of 17 and 21, and without glasses. It became much worse about twelve years ago from an adhesive or sclerotic inflammation of the middle-ears. The static refractive error was:

R. + Sph. 2.00 D. + Cyl. 0.37 ax. $45^{\circ} = 20/30$
L. + Sph. 2.25 + Cyl. 0.37 ax. $135^{\circ} = 20/30?$

Although this patient was only 37 years of age the correction gave her no ability to read at fourteen inches, and the history of the use of the magnifying glass in engraving, and the need of it now to read with, at once suggested paralysis of the accommodation. Bifocal spectacles were ordered with the addition of + Sph. 2.25 as a presbyopic segment. In three weeks she returned to report her hearing better than for

years. She now heard church bells she had not heard for many years, and there was less tinnitus. She feels buoyant, younger and was profuse in her gratitude. At her last visit she stated that she reads and writes with ease and comfort. She had long been unable to work, but with the relief from her glasses she at once secured a position as dressmaker, and despite this kind of work she has no headache, does not use a magnifying or hand glass to read, sleeps better, etc. The old hopelessness and despondency have disappeared, and the improvement in hearing is permanent.

Case 7851 is that of a woman of 35, whose chief complaints are of "nervous dyspepsia," "general weakness of the nerves," depression, apprehensiveness, irritability, etc. She "has always to be on the go." She has "much gas and discomfort after eating." For the last year and a half she has had "a gurgling of gas and a pressure below the heart," whenever she reads or sews too long. Her physician has been treating her for this, and "his medicine cures it if she stops reading and writing and sewing." She has never had much headache, but has often a throbbing in the temples. She feels a nervous shock in the pelvis as acutely as in the head. Some misplacement of the uterus has been corrected. She has worn glasses for eight years prescribed by good oculists, but has had no relief from them, and the last ones ordered made her symptoms worse. This will be understood by the record:

R. + Sph. 1.00 + Cyl. 0.50 ax. 75°
 L. + Sph. 1.00 + Cyl. 0.62 ax. 105°

Her static correction I found to be:

R. + Sph. 2.75 + Cyl. 0.50 ax. $75^{\circ} = 20/25$
 L. + Sph. 2.75 + Cyl. 0.62 ax. $130^{\circ} = 20/25$
 with 60° of hyperphoria.

Plus spheric 2.25 and cylinders were ordered with a partial

correction of her hyperphoria. With these she found so much relief that she at once began to disobey orders and sewed immoderately, "on black," and in six weeks she returned with a recurrence of her old symptoms, especially the digestive reflexes, which she herself traces directly to use of her eyes. I was now prepared to find that I had blundered six weeks before, which I found was true. I had failed to think of a deficient accommodative power. The clearest hints were an increase of the hyperphoria, showing the inability to preserve binocular fusion and the "breaking down" under a great strain of "sewing on black." By adding plus 1.25 spherical to her distance glasses in bifocals her problem was at once solved.

Case 7892 is that of a woman 30 years old, who has been under treatment by general physicians for a long time for gastric symptoms, dyspepsia, etc. She has had pain and nausea after eating, with flatulence and constipation. She is intensely "nervous," cannot go out alone, "trembles" a good deal, is depressed, excitable, and "a worrier." She has had all her life daytime drowsiness and frontal headache nearly every day, culminating in sick-headaches with "awful nausea" and "rush of blood to the head." I found her static error:

R. + Sph. 0.62 + Cyl. 0.62 ax. $100^{\circ} = 20/20$

L. + Sph. 0.62 + Cyl. 0.62 ax. $90^{\circ} = 20/20$
with slight exophoria.

There was good accommodation for distance and I could only order the cylindric correction; I also gave her + Sph. 0.25 and cylinders for reading. These glasses gave her much relief and there was a betterment in all ways, although reading seven weeks later still produced considerable trouble. Then + Sph. 1.00 and cylinders was now ordered for near-work.

Case 7951 was that of a strong, healthy, fine specimen of young womanhood of 21. Ever since the age of 10 she has had occipital headache, and especially following any reading and

study since the age of 15. She has been compelled to forego all near-work, as a half-hour of such strain at once causes the pain. When she gets very tired from any cause the headache is likely to come on. At about the age of ten it was noticed by her mother that one shoulder was higher than the other, and the spine somewhat curved. She was put under the charge of a physical culture teacher and after several years of training the spine became straight. For several months before menophania, at about the age of 14, she had severe sick-headaches with vomiting. There has been none of these attacks for several years. She is sleepy during the day. The consciousness of her headache persists more or less clearly during her sleep at night. About five years ago she had "nervous exhaustion" and was in bed most of the time for a long period. She has worn glasses most of the time during the last five years, but for reading only. I found her wearing, both eyes + Cyl. 0.50 ax. 90°, prescribed by an oculist—a correction which was adding to eyestrain instead of neutralizing it. Her static refraction is:

$$\begin{aligned} \text{R.} + \text{Sph. } 0.25 + \text{Cyl. } 0.25 \text{ ax. } 70^\circ &= 20/20 \\ \text{L.} + \text{Cyl. } 0.25 \text{ ax. } 110^\circ &= 20/20 \end{aligned}$$

She has an exophoria of 1°, but an abduction power of 7°, and an adduction of 24°.

The patient had been sent to me from a long distance and after many failures of other oculists and physicians to cure her headaches. I was therefore greatly worried to find an error of refraction almost impossible alone to cause the severe symptoms, which were most plainly chargeable to eyestrain. In such cases every possible proving of the tests must be gone over and the mistake or the mystery exposed. Retesting only reproved the correctness of the diagnosis, and I was forced to order:

$$\begin{aligned} \text{R.} + \text{Cyl. } 0.25 \text{ ax. } 70^\circ \\ \text{L.} - \text{Sph. } 0.12 + \text{Cyl. } 0.25 \text{ ax. } 110^\circ \end{aligned}$$

This was done in the faint hope that, as sometimes happens,

an irritated and hypersensitive system might be morbidly acted upon by as slight an ametropia as this. Possibly, one knows, a higher degree and an unsymmetric one may have previously existed, and the habit-reflex persist with the slight eyestrain. True to my rule, I hung to the mystery and would not let the patient return home. When the mydriasis should have passed off I noticed that the pupils were still abnormally wide, although the accommodation had returned so that the finest type could be read at near range. This suggestion put me on the track of a solution, as I had several times found that subnormal power of accommodation for persistent use was indicated by physiologically wide pupils. The girl had always had these remarkably wide pupils. All became clear when I found that, although she could see to read even fine print for a little while, and for all ordinary testing, yet she took with great delight from 1.50 to 2.00 diopters plus spheric, and had "never seen printing look like that before." I ordered reading glasses + Sph. 1.50 D. added to her distant correction. If I find the accommodational paresis uniform and continuous, I shall ask this patient of 21 to wear bifocal spectacles, at least for house use. Whereas, before she read for only fifteen or thirty minutes without headache, the report of her physician is as follows: "Not a headache since she began using the glasses. You have not only given her new eyes, but new life. She now says she has never seen like other people, or really ever enjoyed life. Her family are deeply grateful and jubilant over it."

Case 7953 is that of a woman of 34, who has long been afflicted with temporal and occipital headache, culminating in nausea, but not vomiting. The attacks are frequent, and especially so when doing reading or sewing. "When her eyes are bad she has more nausea." She has worn glasses for ten years, generally with some temporary relief of headache with each change in glasses. The last change, made during the last summer, gave no relief. There are daytime drowsiness, chills

with the nausea, a nervous shaking or tremulousness. She is despondent, irritable, easily excited. She was wearing:

R. + Sph. 1.50 + Cyl. 1.00 ax. 80°

L. + Sph. 1.25 + Cyl. 1.50 ax. 90°

By comparing this with her static error, and especially with that I ordered, given below, it will be understood why she got no relief from these glasses. Her mydriatic error I found to be:

R. + Sph. 1.37 + Cyl. 1.62 ax. 85° = 20/20

L. + Sph. 1.00 + Cyl. 2.25 ax. 105° = 20/20

While testing her I noticed that she persistently tilted her head about 10° to the left, and when I found that with the average of her axes of astigmatism there still remained 10° of asymmetry in the left eye which could be rectified only by tilting the head toward the left side, I said to her: "Oh, you are left-handed?" She was surprised that I should have inferred the fact. She was forced to learn to write during childhood with the right hand, is a "very poor writer now," but does all other usually dextromanual acts with her left hand. When she told me that seven years ago her pastor had jokingly spoken to her as the member of his congregation who always looked up at him with her head to one side, I said to her: "You have curvature of the spine." She had never suspected it. Examination of the naked back showed the right shoulder much lower and longer than the other, an upper dorsal curvature of the spine, the convexity to the left, with a compensating curve to the right in the lower dorsal and lumbar regions. The muscular developments and anomalies of the back were those common in such cases. At the postmydriatic examination of the eyes I found that she took a high correction for distance, and this, with other suggestions, led me to suspect subnormal accommodation. I found that + Sph. 1.25 was needed to give her clear and satisfying vision at fourteen inches, and an

ability to carry on near-work without the migraine with which she had so long been tormented. There has been relief of all other symptoms complained of.

Case 7959 is that of a physician of 39, who has consulted the most famous oculists of half a dozen cities, but up to last year has been unable to use the glasses ordered with any relief of his symptoms. The last prescribed gave him comfort, except for reading and writing. Even as a small boy he was pronounced "neurasthenic," and had frontal headaches almost constantly and could study but little. He has always been troubled with insomnia, and of late years he cannot read without intense sleepiness. He is "nervous," depressed, easily worried. Both external recti muscles have been scissored without any relief. His most bitter complaint is of confusion or obfuscation whenever he reads, and is usually unable to understand what he is reading without the most intense effort, and by rereading it several times. He was wearing glasses that corrected his error of refraction with fair accuracy. His static error I found to be:

R. + Sph. 0.75 + Cyl. 0.37 ax. 90° = 20/20
L. + Sph. 0.75 + Cyl. 0.25 ax. 90° = 20/20
with perfect muscular balance.

In such a case there was but one solution: If he had good adduction and accommodation power, eyestrain could not be the cause of his symptoms. And yet his symptoms were beyond all question due to eyestrain. For twenty or more years his professional work had been handicapped, and he had spent much of his life consulting oculists and trying experiments, for he never doubted that it was his eyes which were at fault. I found paresis of the accommodation measured by + Sph. 1.25 D., and ordered bifocals. He at once was able to read and write at pleasure, and with unbounded pleasure, and without a symptom of discomfort or confusion. The first day he wore his spectacles he read two and a half hours, and the

second day one and a half hours on a train—a thing he had never before been able to do. Even in a few minutes, previously, reading or writing brought on the symptoms, which increased with every minute of continuance.

Case 7961 is that of a physician and professor, aged 32, who was wearing, both eyes, + Sph. 1.00, prescribed by an oculist in Germany, after a nonmydriatic examination. His chief symptoms have been aching of the eyes, sleepiness on reading, restlessness, "bloodshot" eyes, blepharitis after reading, and lachrimation. He is completely left-handed, the attempt to force him to write with his right hand in childhood and youth having been a failure, although his left hand was tied behind him. It is fortunate for the man that the foolish attempt was not successful. I ordered for him:

L. + Sph. 0.75 + Cyl. 0.25 ax. 105°	} For distance
R. + Sph. 0.75 + Cyl. 0.25 ax. 125°	
L. + Sph. 1.37 and Cyl. }	} For near-work.
R. + Sph. 1.37 and Cyl. }	

This patient's troubles were henceforth ended.

Case 7964, one of peculiar interest, is that of a young man of 21 who has always had a weak and ailing left eye. He has long been in the habit of convulsively closing and winking it, especially during reading. Great sleepiness is his chief complaint, whenever he is not in the open air. He has been troubled with "biliousness" and constipation. He is always "nervous" and had a "nervous breakdown" in July and August, 1904. He is easily worried and excited, much depressed, and imagines that he has all the diseases described by others. He never feels rested by going to bed or sleep. After his "breakdown," long rest from work and seeming recovery last year, his old symptoms returned when he went back to his office work as clerk. I found his static refraction to be:

R. + Sph. 0.37 + Cyl. 0.62 ax. $90^{\circ} = 20/20 +$
 L. + Cyl. 2.75 ax. $90^{\circ} = 20/200$

There was no disease of the media or fundus of the left and his amblyopia was therefore from disuse. But something told me not to be satisfied with this diagnosis of the error of the left eye and I persisted, long in vain, until I found the following:

L. + Sph. 0.50 + Cyl. 2.75 ax. $90^{\circ} -$ Cyl. 1.12 ax. $60^{\circ} = 20/60$

I am unable to explain the origin of this irregular astigmatism. But I was still unsatisfied, and after a time I was able to demonstrate a remarkable subnormality of accommodation differing in degree in the two eyes. His presbyopic correction ordered was:

R. + Sph. 1.50 with cylinders
 L. + Sph. 2.50 with the two cylinders

In twenty-four hours the visual acuity of the left eye had risen to 20/50, with an immediate disappearance of all symptoms, and a satisfaction in distant and near vision of the most gratifying kind.

These data suggest that:

1. Subnormal, paretic, or insufficient accommodation, or premature presbyopia, even paralysis of the accommodation, of a functional or reflex nature, not dependent upon organic disease, exists in a certain, probably much larger than suspected, proportion of young or middle-aged persons.

2. The youngest of my patients was 20, the oldest 50. Several cases show that the subnormal accommodation existed during adolescence. That eighteen were

women and nine men has only the significance that women are more subject to eyestrain than men because they do more near-work with the eyes, are less resistant, etc.

3. It is usually permanent or ingravescent, although there was complete recovery in one of my cases.

4. It may be caused by such degrees and kinds of ametropia as compel the renunciation of the accommodative function, especially high hyperopia or astigmatism, etc., monocularity, glare of footlights, the use of magnifying glasses in engraving, etc., long-continued abuse of the eyes, a direct inhibiting reflex to the accommodational mechanism. It will be noticed that seventeen of my patients had unsymmetric astigmatism, and most of the others an ametropia or anisometropia unconquerable by the visual mechanism. In many cases there may be no discoverable or pathologic cause, the determining factor being a personal and physiologic peculiarity. We are prone to forget that presbyopia really begins with the beginning of life, as the recession of the near-point commences in infancy, and is continuous throughout life up to the age of sixty or more. In the normal progress, and when uncomplicated by ametropia, this recession, at about forty-five, reaches a degree which makes reading wearying at fourteen inches with ordinary-sized type, because the book and writing cannot be held further away; because the letters are so small, and because the

macular image is too minute. If our arms were five feet long and our printers used type about a third inch in height, all might get on without presbyopic glasses. The crystalline lens of the eye loses its inherited and high elasticity with each year of life. As it has no neurologic connection with the brain, and is not nourished by red blood-corpuscles, this loss of elasticity is most natural. It is consequently as natural and inevitable that its inherited and primary elasticity should differ in different individuals and that local ocular and also systemic disease and denutrition, eye-strain, etc., should still further make the ingravescent inelasticity of varying degrees of progress. The resultant symptoms will depend upon the amount and morbidity of the near-work demanded of the accommodation. The number of those under forty-five with subnormal accommodation is thus probably much higher than supposed and this fact gives us the suggestion to be constantly upon our guard as to its presence.

5. It is of all degrees and varieties, and may even differ in amount in the two eyes.

6. It may complicate the condition of head-tilting, torticollis, etc., with secondary spinal curvature, due to a peculiar axis of astigmatism in the dominant eye. The pathogenic results of dextrocularity and sinistrocularity should not be forgotten.

7. The pathognomonic symptoms are the persistence

Of common eyestrain reflexes (such as migraine, headache, indigestion, intestinal fermentation, constipation, nervous disorders, dermatoses, etc.) after proper correction of the ametropia and muscle imbalance, and especially an inability to carry on continuous near-work.

8. The diagnosis is impossible by any of the ordinary tests. The loss of power has come on so slowly or has been so long present that the patients have no suspicion that the print is not clear, and it is usually possible for them to read even the finest letters with ease, and for a short time. The comparative rarity of the cases also throws the oculist off his guard, and routine begets carelessness. Abnormally wide pupils of one or both eyes, the demand of high corrections for distant vision, certain occupations, certain forms of ametropia and anisometropia, high heterophoria, unrelieved reflexes, photophobia, etc., are suggestions that there may be accommodation weakness.

9. It is an active cause of heterophoria, adding to the proof of the common dependence of muscle imbalance upon ametropic and optical causes. It is therefore an added demonstration, if it were needed, of the mistake of the tenotomists who operate for heterophoria. In the vast majority of cases, heterophoria is ametropic in origin, innervational in nature, and is an effort of nature to lessen eyestrain. The

results of operation are therefore evil, and make the cure more difficult by physiologic methods.

10. The treatment is by means of bifocal spectacles which accurately neutralize the error of refraction for distant, and the deficiency in accommodational power for near vision. As in all treatment whatsoever, success here also depends upon the amount of irreparable damage done before the appropriate therapeutic measure is found. Usually relief is sudden and striking. Whatever of usefulness there is in the nonsensical "fogging system" is explained by the fact of incorrect refraction and subnormal or paretic accommodation.

POSTSCRIPT.

THE DISCOVERY OF SUBNORMAL ACCOMMODATION IN THE YOUNG.¹

To the Editor of American Medicine:—It has now become a common observation that "there is nothing new under the sun." Old discoveries are being constantly rediscovered, often several times, and with no knowledge of the existence of the previous ones. This is largely due to the insufferable amount of medical literature whereby it becomes impossible for late students, especially if busy practitioners, to "read up" and to find the references to previous work. Much of

¹ Reprinted from *American Medicine*, Vol. IX., No. 5, page 180, February 4, 1905.

our literature has misleading titles, much is not properly indexed in catalogues and epitomes, and worse than all is the neglect of literary research work on the part of the authors of text-books. It is astonishing to find how far behind even these most authoritative text-books are in the matter of summarizing the literature and discoveries of previous workers. Important matters are wholly neglected, the echoings of older books repeated as if by rote, and in many respects the book is a generation old before it is issued from the press as an epitome of the latest science. And all this despite the existence of year-books and periodical summaries of progress of a score of kinds and publishing firms. Thus the individual discoverer, in almost unavoidable ignorance of what has already been done, goes on working out anew the old problems and rediscovering old truths. But there are some compensations, of course, for this unfortunate tendency. Each rediscoverer approaches the subject from a somewhat new, or at least individual point of view, and there is thus a peculiar emphasis and light thrown upon the problem. There is also the satisfaction of a confirmation of the truth in value far outweighing all the personal aspects, the claims for "priority," etc. Those whose minds are fervently interested in the scientific or therapeutic truths are glad of the confirmation by previous delvers and happy to give credit to earlier students.

There is still another aspect which may not be for-

gotten: All early discoveries are usually in the beginning partial, and have been led up to by hints, suggestions, incidental phasings of yet earlier workers, so that a too exclusive or decided claim of priority on the part of one may not be valid. Not only, for instance, should Wallace also be honored for the discovery of the principles now called Darwinian, but Lamarck's dues are daily gaining recognition, and many others had previously suggested and dimly recognized or stated the fundamental verities of the evolution or developmental processes of nature.

And lastly should be noted the truth that the method of presentation, the confirmatory evidence, the proper placing, the significance as regards practise and future correlations and extensions may warrant the giving to a later discoverer as much honor as to an earlier one. One illustration of all this has lately come to my knowledge: In 1869 was published an article by Dr. H. Kaiser, in the *Archives of Ophthalmology*, on "Binocular Vision," in which incidentally he advanced the theory of dextrocularity, offering some excellent proofs of it, and giving the name of "the prevailing eye" to what later I called "the dominant eye." In *Ophthalmology*, for January, 1905, there is an abstract of an article by Majewsky, published in 1903, in which Kaiser's theory is independently restated, and his argument and illustrations essentially repeated. Neither

Majewsky, his abstractor, or the editor of *Ophthalmology* were evidently aware of Kaiser's work of thirty-four or more years ago. I have published several articles on the subject in 1904, also ignorant of the studies of Kaiser and of Majewsky. Kaiser's article could only 'be indexed and catalogued under a title which would not suggest the thought of dextrocularity, and Majewsky's work was published in an obscure Polish periodical.

A second illustration occurs in reference to my article published in *American Medicine*, January 21, 1905, concerning "Subnormal Accommodation and Premature Presbyopia." So far as I can learn the credit of the first clear statement of the principle is due to Dr. Samuel Theobald, of Baltimore, Md., published in the *Transactions of the American Ophthalmological Society*, in 1891. But in the *Ophthalmic Record* of April, 1899, Dr. J. G. Huizinga, of Grand Rapids, Mich., under the title "Necessity for Knowing the Range of Accommodation," not aware of Dr. Theobald's study, published an article which shows from a somewhat different point of view the essential truth of Dr. Theobald's contention. So far as I can judge, the road-opening labor of Dr. Theobald and the excellent paper of Dr. Huizinga have had little or no practical results in the actual clinical work of most oculists. When I think of the numerous patients under my own care in

the past whom my ignorance of this relief-bringing measure has not cured of their grievous sufferings, I am heartily ashamed of myself.

Respectfully,

GEORGE M. GOULD.

PHILADELPHIA, January 28, 1905.

THE RECEPTION OF MEDICAL
DISCOVERIES.

R. + Sph. 0.37 + Cyl. 0.62 ax. $90^{\circ} = 20/20 +$
L. + Cyl. 2.75 ax. $90^{\circ} = 20/200$

There was no disease of the media or fundus of the left and his amblyopia was therefore from disuse. But something told me not to be satisfied with this diagnosis of the error of the left eye and I persisted, long in vain, until I found the following:

L. + Sph. 0.50 + Cyl. 2.75 ax. 90° — Cyl. 1.12 ax. $60^{\circ} = 20/60$

I am unable to explain the origin of this irregular astigmatism. But I was still unsatisfied, and after a time I was able to demonstrate a remarkable subnormality of accommodation differing in degree in the two eyes. His presbyopic correction ordered was:

R. + Sph. 1.50 with cylinders
L. + Sph. 2.50 with the two cylinders

In twenty-four hours the visual acuity of the left eye had risen to 20/50, with an immediate disappearance of all symptoms, and a satisfaction in distant and near vision of the most gratifying kind.

These data suggest that:

1. Subnormal, parietic, or insufficient accommodation, or premature presbyopia, even paralysis of the accommodation, of a functional or reflex nature, not dependent upon organic disease, exists in a certain, probably much larger than suspected, proportion of young or middle-aged persons.

2. The youngest of my patients was 20, the oldest 50. Several cases show that the subnormal accommodation existed during adolescence. That eighteen were

women and nine men has only the significance that women are more subject to eyestrain than men because they do more near-work with the eyes, are less resistant, etc.

3. It is usually permanent or ingravescent, although there was complete recovery in one of my cases.

4. It may be caused by such degrees and kinds of ametropia as compel the renunciation of the accommodative function, especially high hyperopia or astigmatism, etc., monocularity, glare of footlights, the use of magnifying glasses in engraving, etc., long-continued abuse of the eyes, a direct inhibiting reflex to the accommodational mechanism. It will be noticed that seventeen of my patients had unsymmetric astigmatism, and most of the others an ametropia or anisometropia unconquerable by the visual mechanism. In many cases there may be no discoverable or pathologic cause, the determining factor being a personal and physiologic peculiarity. We are prone to forget that presbyopia really begins with the beginning of life, as the recession of the near-point commences in infancy, and is continuous throughout life up to the age of sixty or more. In the normal progress, and when uncomplicated by ametropia, this recession, at about forty-five, reaches a degree which makes reading wearying at fourteen inches with ordinary-sized type, because the book and writing cannot be held further away; because the letters are so small, and because the

macular image is too minute. If our arms were five feet long and our printers used type about a third inch in height, all might get on without presbyopic glasses. The crystalline lens of the eye loses its inherited and high elasticity with each year of life. As it has no neurologic connection with the brain, and is not nourished by red blood-corpuscles, this loss of elasticity is most natural. It is consequently as natural and inevitable that its inherited and primary elasticity should differ in different individuals and that local ocular and also systemic disease and denutrition, eye-strain, etc., should still further make the ingravescant inelasticity of varying degrees of progress. The resultant symptoms will depend upon the amount and morbidity of the near-work demanded of the accommodation. The number of those under forty-five with subnormal accommodation is thus probably much higher than supposed and this fact gives us the suggestion to be constantly upon our guard as to its presence.

5. It is of all degrees and varieties, and may even differ in amount in the two eyes.

6. It may complicate the condition of head-tilting, torticollis, etc., with secondary spinal curvature, due to a peculiar axis of astigmatism in the dominant eye. The pathogenic results of dextrocularity and sinistrocularity should not be forgotten.

7. The pathognomonic symptoms are the persistence

of common eyestrain reflexes (such as migraine, headache, indigestion, intestinal fermentation, constipation, nervous disorders, dermatoses, etc.) after proper correction of the ametropia and muscle imbalance, and especially an inability to carry on continuous near-work.

8. The diagnosis is impossible by any of the ordinary tests. The loss of power has come on so slowly or has been so long present that the patients have no suspicion that the print is not clear, and it is usually possible for them to read even the finest letters with ease, and for a short time. The comparative rarity of the cases also throws the oculist off his guard, and routine begets carelessness. Abnormally wide pupils of one or both eyes, the demand of high corrections for distant vision, certain occupations, certain forms of ametropia and anisometropia, high heterophoria, unrelieved reflexes, photophobia, etc., are suggestions that there may be accommodation weakness.

9. It is an active cause of heterophoria, adding to the proof of the common dependence of muscle imbalance upon ametropic and optical causes. It is therefore an added demonstration, if it were needed, of the mistake of the tenotomists who operate for heterophoria. In the vast majority of cases, heterophoria is ametropic in origin, innervational in nature, and is an effort of nature to lessen eyestrain. The

results of operation are therefore evil, and make the cure more difficult by physiologic methods.

10. The treatment is by means of bifocal spectacles which accurately neutralize the error of refraction for distant, and the deficiency in accommodational power for near vision. As in all treatment whatsoever, success here also depends upon the amount of irreparable damage done before the appropriate therapeutic measure is found. Usually relief is sudden and striking. Whatever of usefulness there is in the nonsensical "fogging system" is explained by the fact of incorrect refraction and subnormal or paretic accommodation.

POSTSCRIPT.

THE DISCOVERY OF SUBNORMAL ACCOMMODATION IN THE YOUNG.¹

To the Editor of American Medicine:—It has now become a common observation that "there is nothing new under the sun." Old discoveries are being constantly rediscovered, often several times, and with no knowledge of the existence of the previous ones. This is largely due to the insufferable amount of medical literature whereby it becomes impossible for late students, especially if busy practitioners, to "read up" and to find the references to previous work. Much of

¹ Reprinted from *American Medicine*, Vol. IX., No. 5, page 180, February 4, 1905.

our literature has misleading titles, much is not properly indexed in catalogues and epitomes, and worse than all is the neglect of literary research work on the part of the authors of text-books. It is astonishing to find how far behind even these most authoritative text-books are in the matter of summarizing the literature and discoveries of previous workers. Important matters are wholly neglected, the echoings of older books repeated as if by rote, and in many respects the book is a generation old before it is issued from the press as an epitome of the latest science. And all this despite the existence of year-books and periodical summaries of progress of a score of kinds and publishing firms. Thus the individual discoverer, in almost unavoidable ignorance of what has already been done, goes on working out anew the old problems and rediscovering old truths. But there are some compensations, of course, for this unfortunate tendency. Each rediscoverer approaches the subject from a somewhat new, or at least individual point of view, and there is thus a peculiar emphasis and light thrown upon the problem. There is also the satisfaction of a confirmation of the truth in value far outweighing all the personal aspects, the claims for "priority," etc. Those whose minds are fervently interested in the scientific or therapeutic truths are glad of the confirmation by previous delvers and happy to give credit to earlier students.

There is still another aspect which may not be for-

gotten: All early discoveries are usually in the beginning partial, and have been led up to by hints, suggestions, incidental phasings of yet earlier workers, so that a too exclusive or decided claim of priority on the part of one may not be valid. Not only, for instance, should Wallace also be honored for the discovery of the principles now called Darwinian, but Lamarck's dues are daily gaining recognition, and many others had previously suggested and dimly recognized or stated the fundamental verities of the evolution or developmental processes of nature.

And lastly should be noted the truth that the method of presentation, the confirmatory evidence, the proper placing, the significance as regards practise and future correlations and extensions may warrant the giving to a later discoverer as much honor as to an earlier one. One illustration of all this has lately come to my knowledge: In 1869 was published an article by Dr. H. Kaiser, in the *Archives of Ophthalmology*, on "Binocular Vision," in which incidentally he advanced the theory of dextrocularity, offering some excellent proofs of it, and giving the name of "the prevailing eye" to what later I called "the dominant eye." In *Ophthalmology*, for January, 1905, there is an abstract of an article by Majewsky, published in 1903, in which Kaiser's theory is independently restated, and his argument and illustrations essentially repeated. Neither

Majewsky, his abstractor, or the editor of *Ophthalmology* were evidently aware of Kaiser's work of thirty-four or more years ago. I have published several articles on the subject in 1904, also ignorant of the studies of Kaiser and of Majewsky. Kaiser's article could only 'be indexed and catalogued under a title which would not suggest the thought of dextrocularity, and Majewsky's work was published in an obscure Polish periodical.

A second illustration occurs in reference to my article published in *American Medicine*, January 21, 1905, concerning "Subnormal Accommodation and Premature Presbyopia." So far as I can learn the credit of the first clear statement of the principle is due to Dr. Samuel Theobald, of Baltimore, Md., published in the *Transactions of the American Ophthalmological Society*, in 1891. But in the *Ophthalmic Record* of April, 1899, Dr. J. G. Huizinga, of Grand Rapids, Mich., under the title "Necessity for Knowing the Range of Accommodation," not aware of Dr. Theobald's study, published an article which shows from a somewhat different point of view the essential truth of Dr. Theobald's contention. So far as I can judge, the road-opening labor of Dr. Theobald and the excellent paper of Dr. Huizinga have had little or no practical results in the actual clinical work of most oculists. When I think of the numerous patients under my own care in

the past whom my ignorance of this relief-bringing measure has not cured of their grievous sufferings, I am heartily ashamed of myself.

Respectfully,

GEORGE M. GOULD.

PHILADELPHIA, January 28, 1905.

THE RECEPTION OF MEDICAL
DISCOVERIES.



CHAPTER XII.

THE RECEPTION OF MEDICAL DISCOVERIES.¹

READERS of history are repeatedly struck with the fact that discoveries and new truths which, if accepted and acted upon, would have made for progress and the good of the world, would have saved numberless lives and inestimable suffering, would have been at first rejected; and by the very leaders and judges whose function and duty it was to judge wisely of such things! Instead of discriminating these have almost always shown an utter lack of discrimination, and have condemned the truth to death and its discoverer to silence. After many years the dead discovery is disinterred, and, as it was only a case of suspended animation, it is brought to life and welcomed to a beneficent activity. But probably the discoverer himself was really dead, often of the contumely heaped upon him. The new truth finally accepted, again becomes old dogmatism in the minds of late and belated receivers, and in their turn these resume the old work of rejecting with scorn the new truths which may be discovered in their time. And thus the combination of farce and tragedy is repeated by every generation

¹ From *Annals of Ophthalmology*, October, 1904.

with every discovery. One of the reasons for its pathetic recurrence is that the perpetrators are ignorant both of psychology and history, and therefore have no suspicion that they are recommitting the same old blunders of their forefathers. Religious history is full of capital illustrations of this law, admirably epitomized by White in his "Warfare Between Science and Theology." The history of metaphysics and philosophy offers as striking and as numerous demonstrations of the truth. In science I may cite a few of the many illustrations occurring in recent times:

Galvani, the professor of physics in the University of Bologna, discovered galvanism, as we now term it, and afterward wrote: "I am attacked by two opposite parties—the learned and the ignorant. Both laugh at me and call me the frog's dancing master. But yet I know that I have discovered one of the forces of nature."

The great chemist Lavoisier demonstrated to the Academy that meteorites *could not* fall from the skies, and would not believe, even when he had touched and examined an aerolite.

The possibility of fossil man was denied by the great scientific authorities, Cuvier, the master, pitching the bones out of the window in disgust, and burying the discovery in ridicule for thirty years.

In 1776 Jouffroy invented steamboats and ruined himself financially in demonstrating the feasibility of

his invention. The French Academy of Sciences reported unfavorably, and the inventor was thoroughly lampooned. Fulton, in 1804, was no more successful with the English government, and only succeeded in the United States in 1807. Lardner's famous essay showing the impossibility of the steamship was brought over on its first trip.

Lebon, a Frenchman, discovered how to use gas for illuminating purposes in 1797; he died in 1804 without seeing his invention accepted, and it was only in 1818 that the Parisians would believe in "a lamp without a wick." The English adopted the invention in 1804 in Birmingham, and in 1813 in London.

Franklin's paper on lightning-conductors was laughed at by the Royal Society, which would not publish it in the *Transactions*.

Ohm was treated as a madman by his fellow Germans. The Dutch senators refused the inventor a patent on glasses because they were only adapted to one eye.

A committee of the most eminent engineers of England opposed the use of locomotives on the first complete railroad. Arago in the Paris Chamber of Deputies exposed the fallacy and the folly of those who would use locomotive engines on railroads, and the Bavarian Royal College of Physicians declared that if railroads were constructed the health of the public would be ruined, as the rapid movement of the train

would cause brain trouble, vertigo, etc., in the travelers. It recommended that if used the tracks should be enclosed by high board fences, raised above the level of the cars and engines.

In 1855, when the submarine cable was advocated, a great authority in physics, Babinet, a member of the Institute and an examiner in the polytechnic school, demonstrated the impossibility of the plan in the *Revue des deux Mondes*. Our own Professor Lovering, of Harvard College (afterward President of the American Association for the Advancement of Science), when Field was preparing to lay the first Atlantic cable, demonstrated to his classes the utter impossibility of telegraphing under an ocean 3000 miles wide.

The opposition DaGuerre had in discovering photography is well known. He was put in an asylum because he said he could transfer his likeness to a tin plate.

The abuse heaped on Newton for substituting blind gravitation for an intelligent Deity is another instance.

A practising physician, Young, as early as 1801, hit upon the true theory of the luminiferous ether, and of light and color, which nearly a century before had been discovered by Robert Hooke. But his scientific contemporaries would not see it, and to avoid persecution and deprivation of practice, Dr. Young was compelled to publish his grand discoveries and papers anonymously. Published finally by the Royal Society

(one can imagine the editor's smile of superior wisdom over such trash), they were as utterly ignored as were those of Mitchell, Thomson and Martin as to restrain two or three generations later. Arago finally championed Dr. Young's theory in the French Academy, but the leaders, LaPlace, Poisson, Biot, etc., denounced and conquered, and not until 1823 would the Academy allow the publication of Fresnel's papers on the subject; in about twenty-five years the silencers were themselves silenced. But Young had been silenced, too, his disgust so great that he resigned from the Royal Society, devoted himself to his poor medical practice and to deciphering Egyptian hieroglyphics.

The all-comprehending generalization of the conservation of energy has an equally sorry history. In 1806 Davy first, in a way, introduced the thought and Faraday in 1831 and 1840 developed it a little more explicitly; in 1842 Carnot caught the truth. A German, Mohr, in 1837, uttered it most clearly, and although his article was published in the official magazine it was ignored by his countrymen. Another physician, Mayer, in 1842, noticed that a tropical patient's venous blood was redder than was usual in temperate climates. He followed up the question, *why?* and this time blood-letting resulted in good, and unknown to the world, Dr. Mayer independently thought out the true doctrine of the sun's persistent light and heat. The world did not hear; the contumely he met caused

Mayer, it is said, to throw himself out of a window. In the fifties a Manchester manufacturer read a paper before the British Association, and no one heeded it in the least. Two years later he tried to read another, but the chairman would permit only a brief verbal synopsis. The leaders were again not leading, and even Faraday, Brewster, and Herschel could not accept and all the official judges of the world were silent. Whewell in his "History of Inductive Sciences" does not mention the theory of Mayer and Joule. It was only rising, young and unknown men that finally brought the work and its value to recognition. It is, indeed, usually the young ones that made, and that still make the discoveries. Davy, Young, Fresnel, Arago, Forbes, Joule, Mayer, Helmholtz, Sir Wm. Thomson, Clausius, Rankine and others were in their twenties when they made their greatest discoveries.

The whole thinking world, says Williams, repudiated Lamarck's epoch-making philosophy of the transformation of species, as it had done with that of Erasmus Darwin—repudiated with acclaim. The official judges, and especially the great Cuvier, denied and opposed, and Lamarck died in 1829 without seeing any recognition of his truth; it lay dead for a generation. "Heresy" and "impious visionary" were the verdicts of theology and of science. "The whole conservative majority of mankind recoiled with hor-

ror," is also the statement of the historian concerning Darwin's contribution.

In 1865 an Austrian monk published the report of some experiments in heredity. No scientist looked at his article or saw its purport for thirty-five years, although his paper was sent to all scientific journals and societies. Mendel's law is now acknowledged to be one of the most profound and illuminating in modern developmental science, and his name will go down to posterity with those of Darwin and Lamarck. Darwin, prevented by his eyes from knowing well the world's scientific literature, published his "Animals and Plants" in 1868, without having seen Mendel's article.

In medicine it is particularly unfortunate to reject offered truth and discovery, because medicine is at heart both science and philanthropy, and the nonacceptance means at once lack of knowledge, and the nonrelief of patients at the instant under the care of the skeptic. Rejection of a medical truth becomes immediately condemnation of the patients to death or to a continuance of their suffering. The history of the discovery, the reception and the rejection of vaccination is a perennial illustration.

Inoculation of cowpox as a protection against smallpox was known by many nations in past ages. Humboldt says it was understood and practised by Mexican shepherds. The dairy folk of Europe knew of it, and

especially those of England, long before the brave Dorsetshire farmer, Benjamin Jesty, inoculated his wife and two children from the teats of the cows. The experiment was successful, but not even Jenner dared to repeat it on the Phipps boy until twenty-two years had passed. It was still a long time before the profession and the world accepted the measure, and the opposition was so great that it was passed down to the ignorant of our own time. Only Germany and Japan have become civilized enough to accept it fully, and they have no smallpox. The rest of the world is still paying the penalty for its sad disbelief. For instance, in 1885, during nine months, 3,164 Canadians died from neglect of vaccination, and all the patients caught it from one case of the disease imported from Chicago. The extent of the anti-vaccination movement to-day among the ignorant is an indication of the bitterness and length of the struggle of the supposedly enlightened. For the law of heredity applies to medical prejudice and superstition. The longer in forming, the more enduring is the "cake of custom." Hence, Mrs. Eddyism and medical magic generally are powerful, and will long remain.

In 1760 Auenbrugger had discovered the principle of thoracic percussion and published a book making it known to the world. He wrote in his preface to this work:

"My discoveries in this subject are not committed to paper

because of an itch for writing, nor an inordinate desire for theorizing. Seven years of observation have put the subject in order and have clarified it for myself and now I feel that it should be published.

"I foresee very well that I shall encounter no little opposition to my views and I put my invention before the public with that anticipation. I realize, however, that envy and blame and even hatred and calumny have never failed to come to men who have illuminated art or science by their discoveries or have added to their perfection. I expect to have to submit to this danger myself, but I think that no one will be able to call any of my observations to account. I have written only what I have myself learned by personal observation over and over again, and what my senses have taught me during long hours of work and toil. I have never permitted myself to add or subtract anything from my observations because of the seductions of preconceived theory."

In 1774 Van Swieten, a distinguished writer on medicine, published a learned work on medicine, and in 1779 appeared De Haan's eighteen-volume "System of Medicine"; neither had heard anything of Auenbrugger or of percussion. In France Corvisart practiced percussion fifteen years without convincing his colleagues of its value. Auenbrugger's book had been published in 1770, but not till 1808 did French physicians accept the device. Napoleon made Corvisart his personal physician, because attracted by his progressiveness illustrated in practising percussion. His other physicians had told Napoleon that his trouble was *gale répercutée*, *i. e.*, itch struck in. That was the official science of the day, which Hahnemann

“potentized” and consecrated. The peasant women of Poland knew more about the itch than Hahnemann and all the medical men of Europe. The poor girls had found out that the *acarus scabei* could be dislodged from beneath their skin with their sewing needles. When the unscientific Parisians heard of this procedure there was an end forever of the scientific *gale répercutée*.

In Boston a dentist, Dr. Morton, had demonstrated that a surgical operation could be performed, the patient being unconscious from administration of sulfuric ether. Before this the surgeons of Europe had despaired of such a discovery, and while the news of Morton's discovery was on its way to Europe, the leader of English surgeons, Sir Benjamin Brodie, said anesthesia was impossible. Following Morton's discovery there was incredulity and outcry; the shock of pain was beneficial to the patient, said some surgeons; the pulpit said pain was God-given, etc. Morton had great difficulty in getting the profession to recognize the value of the discovery, and when this had been effected, disgraceful attempts were made to rob him of the honor. Sir James Y. Simpson only conquered the prejudice against the use of chloroform in childbirth, by quoting the biblical story of the Lord throwing Adam into a deep sleep before Eve's creation.

Every student of the history of medicine knows of the fight made against the theory of microorganisms

as the cause of fermentation and of certain diseases. In 1762, Pleincz, of Vienna, a scientific mind, had stated that the phenomena of disease and of decomposition of animal fluids were wholly caused by these minute organisms. Later the great authority, Liebig, withstood the doctrine so persistently and successfully that for twenty-five years, until Pasteur came, the "vitalistic theory" was compelled to keep silent; and even when Devaine showed that anthrax was due to one variety, the world would not be convinced, until in 1876 Pasteur ended the bitter controversy by the famous anthrax test on sixty animals, in which the thirty that had been protected lived, and the thirty that had not been protected died.

The two greatest authorities on the subject signed the adverse report against Dr. John Snow's findings as to the pollution of the famous Broad Street well, thus postponing the knowledge of the true nature of water-borne diseases.

How bitterly for about twenty years the discovery of Pasteur and Lister was fought and scorned by physicians is well known. For ten and even twenty years after the demonstration, hospital gangrene killed as of old. The surgeon, Chassaignac, warned Pasteur that "laboratory results should be brought out in a circumspect, modest, and reserved manner, etc."

We are still living in the end of the professional

struggle against Behring's antitoxin serum for diphtheria. Others are to come.

When the great brave McDowell published his work in 1809, all who knew of it condemned it. It was forty or fifty years before it was at all appreciated, and even then Atlee and the followers of Tait met with bitter opposition before ovariectomy was recognized as a justifiable procedure.

In his great essay our own O. W. Holmes in 1843 showed himself the true John the Baptist of antiseptics, because he contended, long before the germ theory of disease was recognized, that puerperal fever was a contagious affection. Of course he met the bitterest opposition from all the leaders of the profession, Hodge, Meigs, etc. In Vienna two years later, not knowing of Holmes' book, Semmelweis tried to convince his fellow practitioners of the same self-evident fact. He taught the use of a chlorin solution as a disinfectant. The violence of the hatred aroused in the hearts of his professional brethren was so great, that Semmelweis was driven from his professorate and ruined professionally and financially. Even in 1856, in the Paris Maternité 64 women died out of 347 admitted, and in 1864, 310 out of 1,350. At last, in 1874, Fournier and Budin succeeded in introducing the new views of Pasteur and Lister in spite of what Dr. Roux calls "the tyranny of medical education," and puerperal fever forever disappeared.

The autobiography of J. Marion Sims gives another chapter of this world-wide stupid malevolence, or malevolent stupidity. His struggle against the fierce opposition of those whose office it was to know science and to do right was most pathetic. He nearly starved to death during many years in which his professional colleagues utterly ignored him; then their hatred and opposition gave him some encouragement, until finally the denouncers themselves became silent, or "always had recognized the real value of the truths advocated."

In the closing years of the eighteenth century Tuke in England, Pinel in France, and Rush in America, contended that chaining maniacs with riveted iron bands in dungeons, often in darkness, and always in filth, was neither medicine nor humanity. It took a life-time to effect partly their reform, and even to-day it is not entirely completed.

The French Academy ridiculed the discovery of Desmoulins as to senile atrophy of the brain, and forbade the iconoclast the privilege of further hearings.

Bell's great discovery as to the functions of the anterior and posterior roots of the spinal nerves, made in 1811, was ignored by the court of final appeal in Paris, and not until 1823 was it in part accepted.

"The fundamental law of psychophysics," formulated by Weber, was ignored and denounced for over

especially those of England, long before the brave Dorsetshire farmer, Benjamin Jesty, inoculated his wife and two children from the teats of the cows. The experiment was successful, but not even Jenner dared to repeat it on the Phipps boy until twenty-two years had passed. It was still a long time before the profession and the world accepted the measure, and the opposition was so great that it was passed down to the ignorant of our own time. Only Germany and Japan have become civilized enough to accept it fully, and they have no smallpox. The rest of the world is still paying the penalty for its sad disbelief. For instance, in 1885, during nine months, 3,164 Canadians died from neglect of vaccination, and all the patients caught it from one case of the disease imported from Chicago. The extent of the anti-vaccination movement to-day among the ignorant is an indication of the bitterness and length of the struggle of the supposedly enlightened. For the law of heredity applies to medical prejudice and superstition. The longer in forming, the more enduring is the "cake of custom." Hence, Mrs. Eddyism and medical magic generally are powerful, and will long remain.

In 1760 Auenbrugger had discovered the principle of thoracic percussion and published a book making it known to the world. He wrote in his preface to this work:

"My discoveries in this subject are not committed to paper

because of an itch for writing, nor an inordinate desire for theorizing. Seven years of observation have put the subject in order and have clarified it for myself and now I feel that it should be published.

"I foresee very well that I shall encounter no little opposition to my views and I put my invention before the public with that anticipation. I realize, however, that envy and blame and even hatred and calumny have never failed to come to men who have illuminated art or science by their discoveries or have added to their perfection. I expect to have to submit to this danger myself, but I think that no one will be able to call any of my observations to account. I have written only what I have myself learned by personal observation over and over again, and what my senses have taught me during long hours of work and toil. I have never permitted myself to add or subtract anything from my observations because of the seductions of preconceived theory."

In 1774 Van Swieten, a distinguished writer on medicine, published a learned work on medicine, and in 1779 appeared De Haan's eighteen-volume "System of Medicine"; neither had heard anything of Auenbrugger or of percussion. In France Corvisart practiced percussion fifteen years without convincing his colleagues of its value. Auenbrugger's book had been published in 1770, but not till 1808 did French physicians accept the device. Napoleon made Corvisart his personal physician, because attracted by his progressiveness illustrated in practising percussion. His other physicians had told Napoleon that his trouble was *gale répercutée*, i. e., itch struck in. That was the official science of the day, which Hahnemann

“potentized” and consecrated. The peasant women of Poland knew more about the itch than Hahnemann and all the medical men of Europe. The poor girls had found out that the *acarus scabei* could be dislodged from beneath their skin with their sewing needles. When the unscientific Parisians heard of this procedure there was an end forever of the scientific *gale répercutée*.

In Boston a dentist, Dr. Morton, had demonstrated that a surgical operation could be performed, the patient being unconscious from administration of sul-furic ether. Before this the surgeons of Europe had despaired of such a discovery, and while the news of Morton's discovery was on its way to Europe, the leader of English surgeons, Sir Benjamin Brodie, said anesthesia was impossible. Following Morton's discovery there was incredulity and outcry; the shock of pain was beneficial to the patient, said some surgeons; the pulpit said pain was God-given, etc. Morton had great difficulty in getting the profession to recognize the value of the discovery, and when this had been effected, disgraceful attempts were made to rob him of the honor. Sir James Y. Simpson only conquered the prejudice against the use of chloroform in child-birth, by quoting the biblical story of the Lord throwing Adam into a deep sleep before Eve's creation.

Every student of the history of medicine knows of the fight made against the theory of microorganisms

as the cause of fermentation and of certain diseases. In 1762, Pleincz, of Vienna, a scientific mind, had stated that the phenomena of disease and of decomposition of animal fluids were wholly caused by these minute organisms. Later the great authority, Liebig, withstood the doctrine so persistently and successfully that for twenty-five years, until Pasteur came, the "vitalistic theory" was compelled to keep silent; and even when Devaine showed that anthrax was due to one variety, the world would not be convinced, until in 1876 Pasteur ended the bitter controversy by the famous anthrax test on sixty animals, in which the thirty that had been protected lived, and the thirty that had not been protected died.

The two greatest authorities on the subject signed the adverse report against Dr. John Snow's findings as to the pollution of the famous Broad Street well, thus postponing the knowledge of the true nature of water-borne diseases.

How bitterly for about twenty years the discovery of Pasteur and Lister was fought and scorned by physicians is well known. For ten and even twenty years after the demonstration, hospital gangrene killed as of old. The surgeon, Chassaignac, warned Pasteur that "laboratory results should be brought out in a circumpect, modest, and reserved manner, etc."

We are still living in the end of the professional

struggle against Behring's antitoxin serum for diphtheria. Others are to come.

When the great brave McDowell published his work in 1809, all who knew of it condemned it. It was forty or fifty years before it was at all appreciated, and even then Atlee and the followers of Tait met with bitter opposition before ovariectomy was recognized as a justifiable procedure.

In his great essay our own O. W. Holmes in 1843 showed himself the true John the Baptist of antiseptis, because he contended, long before the germ theory of disease was recognized, that puerperal fever was a contagious affection. Of course he met the bitterest opposition from all the leaders of the profession, Hodge, Meigs, etc. In Vienna two years later, not knowing of Holmes' book, Semmelweiss tried to convince his fellow practitioners of the same self-evident fact. He taught the use of a chlorin solution as a disinfectant. The violence of the hatred aroused in the hearts of his professional brethren was so great, that Semmelweiss was driven from his professorate and ruined professionally and financially. Even in 1856, in the Paris Maternité 64 women died out of 347 admitted, and in 1864, 310 out of 1,350. At last, in 1874, Fournier and Budin succeeded in introducing the new views of Pasteur and Lister in spite of what Dr. Roux calls "the tyranny of medical education," and puerperal fever forever disappeared.

The autobiography of J. Marion Sims gives another chapter of this world-wide stupid malevolence, or malevolent stupidity. His struggle against the fierce opposition of those whose office it was to know science and to do right was most pathetic. He nearly starved to death during many years in which his professional colleagues utterly ignored him; then their hatred and opposition gave him some encouragement, until finally the denouncers themselves became silent, or "always had recognized the real value of the truths advocated."

In the closing years of the eighteenth century Tuke in England, Pinel in France, and Rush in America, contended that chaining maniacs with riveted iron bands in dungeons, often in darkness, and always in filth, was neither medicine nor humanity. It took a life-time to effect partly their reform, and even to-day it is not entirely completed.

The French Academy ridiculed the discovery of Desmoulins as to senile atrophy of the brain, and forbade the iconoclast the privilege of further hearings.

Bell's great discovery as to the functions of the anterior and posterior roots of the spinal nerves, made in 1811, was ignored by the court of final appeal in Paris, and not until 1823 was it in part accepted.

"The fundamental law of psychophysics," formulated by Weber, was ignored and denounced for over

twenty years by the scientific associates, until Fechner made them listen.

In 1825 Dr. Boillard had located the speech-center in the brain, but despite his pertinacity the world would not listen, and the cerebral localization of function waited until about fifty years later it was in great part threshed out, though even great masters, as Goltz, still denied within the last generation.

It is doubtful if there is a single important discovery in all the history of medicine which was not at first either ignored or opposed. If a man is himself an authority and power, the ignoring and hatred of him will find vent in both ways. If he can be snuffed out by silence alone, that is the plan pursued. What a combination of thick-witted blundering and malignity!

For, what at last has the light-bringer to gain by his temerity? What crime against religion and the simple law of kindness, to treat him and his announcement, even if not true, with anything but a careful hearing and respectful testing! These few men with minds capable of discovering and benefiting mankind are the most precious products of the groaning and travailing ages. They are the prerequisites of progress, martyrs, sufficiently, of their own sensitiveness and unselfishness, without the added and heaped sorrow of cold neglect, of colder disdain, and of an immeasurably inhuman cruelty. Men will help raise a monument to one of their martyrs, go home with their throats still

hoarse from praising and hurraing, and at once resume the making of new martyrs, as their grandfathers did of the dead one of the monument! As Pope said: "They help to bury whom they helped to starve."

The principal methods of killing new truths, as shown in historical examples are, therefore, these:

1. By silence and ignoring.
2. By opposition on supposed scientific grounds.
3. By opposition and denial *per se*, without giving reasons.
4. By ridicule and sneers, also without reasons.
5. By the cry of exaggeration and hobby-riding, without explanation or instance.
6. By pointing out real or partial errors and exaggerations, emphasizing them, and saying nothing as to the truth admitted or not admitted.
7. By saying that the theory is old, long admitted, or long ago refuted.
8. By "insinuendos" that the author is advertising himself from the motives of vanity or the desire for practice, etc.; that he has, as Dr. Sachs charges, "private axes to grind."

All of these methods of preventing the acceptance of discoveries, and their practical applications are psychologically devices of the balking mind to obviate troublesome changes in mental attitude, undesired activity in new ways, etc., and in reality are motivated

upon one or another, or several of the following combined conditions:

1. Mental laziness. The ordinary mind (and therefore the pseudoscientific one) desires certainty, settledness of habit, rest in the known, ease in the Zion of the acquired and satisfying. New thought and new truth is an affliction, a spur to new activities and change of life.

2. Wounded vanity. "I did not make this discovery or think of it," one seems to hear, "and every method (in practising medicine, *e. g.*) of future action must be changed, and the confession thus made every day that I was before in the wrong and that my knowledge was error. It is too humiliating."

3. Prejudice. A position once taken, an opinion once accepted, a party once publicly espoused, gives a seeming warrant for continuance of the old and trusted belief.

4. The authority of leaders. "The great authority so and so," one hears again, "is unconvinced, and he knows better than I, or the upstart, and I will wait until he changes his opinion," the motive being cunning safety.

5. Influence of societies. The greater the power and attendance of governing and authoritative societies the more certain are they to oppose new truth and discovery. The old leaders never lead. The crowd-instinct tends to sweep its members to a unity of

indulgence in tradition and the sacredness of the truth heretofore established. For the same reason the official journals of powerful or large medical societies are always likely to be on the wrong side as to medical discoveries.

6. True and confessed ignorance and inability to decide. The vast mass of men, or a class of men, must be incapable of deciding upon a matter about which they have no first-hand knowledge, and for which special as well as general culture is demanded. Some, or indeed many of these, must recognize this fact concerning themselves, and thus wisely wait for the tide of opinion to change.

7. The financial cost. This is an increasingly dominant motive. In making the greatest discoveries of modern times a poor practising physician, Dr. Young, had to publish his articles anonymously because of the danger to his practice from being scientific. The historian records that patients demand of their doctor "sophistry rather than philosophy." Nothing blights a modern young practitioner's reputation quicker, prevents his "success" more assuredly, kills his hopes of professorships and offices and hospital positions speedier, than so-called "exaggeration" and "hobby-riding." Add to this that those who already have private sanitariums and consultation practices to sustain, must be extremely wary in avoiding the calumny

that comes from "extremism." Lastly, many medical journals are purely commercial undertakings, and have the publishers' profit always in mind, or the editor's interest in some patent or secret nostrum, or institution. The editorial position and salary are powerful arguments.

8. True and genuine conservatism, both good and bad. It is indeed well to get out of the old truth all its good before renouncing it. Many too hastily accepted theories and discoveries have proved to be will-o'-the-wisps leading to bogs and disappointments. As to this, however, the obvious answer is that it proves at best a lack of discriminating ability on the part of the too lenient acceptors; and finally their condemnation is complete in the fact that testing is the needed thing both of the new false and of the new true proposition. False conservatism is that which does not test, either in its acceptances or in its rejections, and true conservatism is that which neither denying nor assenting, tests and weighs.

Turning from general scientific and past medical illustrations of the opposition to new truths, it may be more illuminating to give one striking instance which is taking place in our own time. The data are at hand, which is not always so, at least specifically, of others; and to catch our contemporaries and colleagues, our very acquaintances, *in flagrante delicto*, is more in-

structive than when we read only of those who are dead and gone.

The first word, so far as I am aware, publicly uttered, which announced that ametropia had pathologic or morbid systemic consequences was that of the dean of the American ophthalmologic profession, Dr. John Green, of St. Louis. In 1867¹ he had concluded that astigmatism was an active cause of myopia. Soon after 1861 Dyer, of Philadelphia, had begun to prescribe astigmatic lenses, but there is nothing, so far as I can learn, to show that he had any belief or proof that ametropia caused ocular or systemic disease. This honor, therefore, belongs to Dr. Green, so far as the relation to the eye is concerned. To Thomson, of Philadelphia, and secondarily to Norris, of Philadelphia, belongs the equal and in its consequences, greater honor of suggesting that the evil effects of eyestrain extended also to the brain and nervous system, and thence to the functions of other systemic organs. In conscientiously and ingeniously correcting the astigmatism, etc., of his patients, Dr. Thomson found that they came back and reported relief of headache and other distressing symptoms and with the discerning eye of the true clinician he noted, retested and re-proved the reports. This was just prior to 1874. Dr. Thomson spoke to Dr. S. Weir Mitchell, a neurologist of Philadelphia, of his new findings, and Mitchell at

¹ *Arch. Ophthal. and Otol.*, 1869, I., No. 1, pp. 17-21.

once seconded them and published three articles¹ concerning Dr. Thomson's cases, in which it was shown headaches, insomnia, vertigo, nausea and failure in general health were consequences of refractive and accommodative anomalies of the eyes. Two of the cases reported in these articles of Mitchell were of patients of Dr. Norris. The facts were discovered by Thomson and Norris; Mitchell, adding nothing original, simply made them public. Dr. Thomson followed up his early observations and in 1879 published a noteworthy and confirmatory article² on "Astigmatism as a cause for persistent headache and other nervous symptoms."

In the first case, to ametropia was ascribed "some forms of chorioidal disease, fatigue and pain in the eyes, congestion, inflammation of the lids and conjunctiva, nutritional changes in the fundus, neuralgic pains over the frontal region, throughout the head, and even vertigo and nausea." These were entirely cured by glasses.

In the second case reported, supposed "disease of the brain and spinal cord" had been treated for many years by distinguished men in the chief American and European cities. The least use of this patient's eyes

¹ *Medical and Surgical Reporter*, July 25, 1874, and August 1. *Ibid.*, February 6, 1875, and *American Journal Medical Science*, April, 1876.

² *Medical News and Library*, June, 1879.

produced a long list of mental and neurologic symptoms, ending in "a fit of some kind," and recovery was by renouncing his pen, walking in the open air, etc. Immediate and complete relief for nine years followed the use of Dr. Thomson's lenses. Then presbyopia was at hand, and Dr. Thomson prescribed for the complication, but the Parisian optician who filled the prescription thought he knew better and gave the patient the wrong glasses. All of the old symptoms returned, until correct lenses were ordered and the symptoms disappeared.

The third case was that of a naval officer with pain at the base of the brain, tinnitus, mental restlessness, inability to do mental work, pain over the left brow, extending to the occiput, severe tension of the head, failure of mental vigor, etc. He resigned, lived in open air a year, thought himself recovered and returned to work, with immediate resumption of all the old symptoms.

"Cerebral congestion" was now diagnosticated by a great authority in the diseases of the nervous system. (They are still making the same diagnosis, sometimes calling it "psychosis," or "neurasthenia," etc.) Life in the open air was again ordered. "Migraine" developed, "nervous headaches," scotoma scintillans, hemicrania, hemianopsia, and nausea. Proper glasses ordered by Thomson gave almost complete relief.

The fourth case was one of sick headache on near

use of the eyes. Spherical glasses alone gave no relief, but cylinders did so. A sudden recurrence of the old severe symptoms resulted in the discovery of a blunder, which is still frequently being made: An optician (probably an "eyes-examined free" man, or "a refracting optician") had repaired the accidentally broken frames and reversed the lenses so that the woman "had now two astigmatic eyes instead of one." Almost complete relief followed Dr. Thomson's correction.

The fifth case reported by Dr. Thomson was of a school girl who had been obliged to quit school because of severe pain in the back of the eye, twitching of muscles, etc. Mother and grandmother had been suffering from neuralgic headache and ill-health. All three were found to be astigmatic and all were cured by Dr. Thomson's glasses.

I have epitomized these admirably reported cases, because, together with those summarized in "Biographic Clinics," Vol. I., they form the earliest demonstration of what has been taking place in every competent oculist's office every day since.

But, note well, these reports and others that followed, were absolutely and utterly ignored by the whole world. There is not, I believe, a line in medical literature, European or American, showing that they were read, certainly none that suggests that they instigated any practitioner having patients with such

diseases to try the experiment of accurate correction of ametropia. How many thousands, should one not say millions, have gone on suffering as before, with these symptoms, treated as cases of "brain congestion," "brain disease," "dyspepsia," "neurasthenia," "hysteria," "gastric disease," "psychosis," and all the rest? Hundreds of testimonies have since been added by intelligent and honorable physicians, and thousands of such cases have been reported; and yet there are great physicians, neurologists, "distinguished authorities," psychiatrists and diagnosticans, who are as silent as they have been on this subject for twenty-five years, or who break that silence only to ridicule and scoff. To-day in every oculist's office there appear patients who for years, few or many, or for a lifetime, have vainly sought relief from one after another of these authorities, of just such sufferings. And to-day they are cured by the careful oculist just as quickly and permanently as they were by Dr. Thomson. To-day if an "optician" misplaces a lens of their spectacles they have the same recurrence of symptoms which Dr. Thomson's patient had. There are great and famous neurologists who have contempt and loathing for the mere suggestion of a morbid reflex, although their epiglottis unconsciously and reflexly saves them from suffocation by its reflex action with every swallow taken; although every motion and function of the body is reflex; and although pathology

is only morbid physiology. It is, indeed, pertinent to inquire as to the reasons for and methods of this amazing fact.

When an author issues a scholastic and learned text-book, or encyclopedia upon a general subject, it is a point of pride with him to show thoroughgoing acquaintance with the literature of the subject. The most recent and the most scientific text-book on the subject of medicine is that of Allbutt. It does not contain a word about the eyestrain origin of any disease. Probably there is no European text-book on general medicine, gastric diseases, nervous and mental diseases, which mentions eyestrain as a cause. Indeed those on ophthalmology are as indifferent to the matter, or their mention of the fact is incidental, and calculated to make the reader ignore it rather than follow it up. In our country Osler gives the subject a general and vague allusion in a sentence or two. Tyson and Anders are less generous. Anders does not allude to it in the treatment of migraine, nor does the New International Encyclopedia. The only work on general medicine of which I know that has acknowledged the ocular origin of migraine is "Essentials of Diagnosis," Cohen & Eshner, 1892. Einhorn, Hemmeter, and others on stomachal diseases make no mention of the eye as a cause.

As to "the psychoses" the opinion of the authorities is approvingly quoted by Dana in a paper read before

a special meeting of the New York Academy of Medicine,¹ instigated to demolish the eyestrain theory. "I cannot find," he says, "any systematic writer who even refers to it."

Dana sums up his experience in saying that he has "found hardly any case in which eyestrain is an important and direct factor in establishing even a minor psychosis." Accuracy in refraction is not necessary in treatment, because "success is generally obtained without treating the eyes," and "glassing has become something of a minor psychosis." The acme of the ludicrous is, of course, added:—"I heartily believe that eyestrain should be carefully looked after."

At the same meeting referred to, Dr. Sachs said that very few cases indeed of epilepsy, chorea and the convulsive tics, are due to eyestrain, and cures by ocular treatment are fewer indeed. "The relation may be a close one," he says, "in the minds of some faddists, but is remote in the minds of those who have no axes to grind, etc." This is charming and highly characteristic! Dr. Sachs also incorrectly epitomized the incorrect statements of Dr. Spratling as regards the tests upon a number of epileptics at Craig Colony, concerning the influence of glasses. The same gloating delight at the "disappointing" results is echoed in many medical journal editorials and abstracts. The least desire to be truthful would have stated what has

¹ *Medical News*, July 30, 1904.

been published in connection with Dr. Spratling's report,¹ that by all the other methods of treatment pursued at Craig Colony, according to its official figures, the cures amounted to one in eighty, while in "glassing" the cures were one in fifty-seven!

The reduction in the total number of seizures in three months following the test with glasses in fifty-seven cases was 44 percent. And yet, Dr. Sachs says, "there is no good excuse for attempting to argue with" the foolish faddist—and he is perfectly right. The repeater of false statistics does not, indeed, "argue" with any one.

At the meeting referred to at which the sentence, death, burial, and chanting of the Requiescat was carried out upon poor Eyestrain, Dr. Collins said that no case of migraine had been cured, remedied, or benefited by glasses; and that was bravely done, without a single anchor cast in any direction. He should have quoted the saying of the great and distinguished neurologist, Professor Möbius, still living and writing, that "the tendency to headache is a part of the degeneration which is inseparable from civilization." Or, better still, he might have proceeded to the logical conclusion of Dr. Seguin and advised abandoning all medical treatment in epilepsy, and thus encouraging the recurrence of the convulsions. "Knowledge to

¹ But not acknowledged or referred to by him.—See *American Medicine*, April 9, 1904.

one is a goddess, to another an excellent cow," sang Schiller long ago.

Two of the helpers drummed up for the occasion, alas, must have been sadly "disappointing" to the generals. One proved an alibi and the other proved a traitor. Both happened to be physicians as well as neurologists. Dr. Holden, in about ten thousand words concerning hysteria, neurasthenia, etc., wisely refrained from saying a word for or against the ocular origin of these diseases. Dr. Cutler actually said that "many cases of sick-headache are relieved by treating the eyes or other peripheral organs," and "sick-headache having all the clinical features of migraine is often a reflex neurosis of ocular origin." How bitter must have been that medicine for the distinguished gentlemen responsible for the meeting!

It needed only the hearty baritones of two famous oculists to pronounce the benediction of the burial service with fitting conclusiveness. Dr. Knapp is credited with the profoundly ludicrous remark that "eye-strain is due to over-exertion of the eye," and Dr. de Schweinitz returned to Philadelphia after having said that he was "glad of the firm stand taken by the Academy on the conservative side." The report does not add that the corpse of the criminal came to life and also returned to Philadelphia, where it is still laughing cheerily at the fun he had, though sorry for the fate of the migrainous patients in and about New

York. His was simply a case of suspended animation due to severe attack of migraine, because he had forgotten his Philadelphia spectacles.

Those medical journals which have shown the most unqualified disgust and bitterness against the eyestrain theory and theorists are, in the order of their violence, *The Medical News*, *The Medical Brief*, *Modern Medical Science* (an anti-vaccination and pro-bovine publication), *the Homeopathic Recorder* and *The Post-graduate*. Others preserve some trace at least of good manners and caution, but with these neither is to be found. The first mentioned periodical goes out of its way with rage and most impolitic compliment, to demolish and rend, in three long, over-long, editorials. In neither does it tell its readers anything about the arguments or intention of the writer so heartily despised. A gathering of the scurrilous epithets indulged in by the hasty editor would fill a page, and would prove uninteresting except to makers of slang dictionaries and to yellow newspaper reporters. However, one is at least capable of understanding this excerpt:

“We are content to leave these papers to the judgment to which the scientific world will undoubtedly subject them, and to the oblivion to which it will eventually consign them. Writing them down would be a work of supererogation in the case of literary products which are foreordained to perish. The author's screed should have been consigned to the wastebasket. We live in just the age for these things. The times are prolific in all sorts of ‘healers’ who play their antics,

literary or oratorical, before the public in their own ways. Dowie and Mrs. Eddy are, of course, outside the pale of rational criticism, but unfortunately there are spectacular prophets within the ranks of the medical profession itself, and these do not scruple to distort facts, to originate fantastic theories, to use exaggerated language, and to indulge in coarse invective, Dowie-like, etc."—*Medical News*, November 14, 1903.

"An epidemic of fantastic belief," is the characterization of the *Postgraduate*, and it is a sufficient self-characterization of its writer. Cynical persiflage was expected of the *Medical Record* of that day, but its usual good wit was rendered bitter by too serious a desire to hit hard the "furious rider of this hobby." "It cannot be productive of good" of the *New York Medical Journal*, fails to suggest any possible harm that could come of trying glasses on a patient who has "a functional disease whose nature is unknown," and which is confessedly incurable by any other method.

The Boston Medical and Surgical Journal admits all that any one but an "extremist" and "exaggerator" could desire, at least all that I desire, but still charges extremism, and reiterates its expression, "an overworked theory." This is the burden of so many reviews that a word or two may be replied. All who take this position are so strangely and furiously set upon the denunciation of the exaggeration that they quite forget the admissions they have made of "essentially right," "fundamentally true," "eyestrain is indeed a cause of many distressing ailments," "the eyes

are, it is true, the source of much cerebral and systemic disease," etc. Why does the truth at the foundation concern them so little, and the "over-emphasis" concern them so much? If there is a great truth "over-estimated" and "over-worked," why not bring to the absolute deniers and ignorers the knowledge of the truth in the "hobby-rider's" contention and not encourage them in their delusion by exaggeration of the oculist's exaggeration? This class of critics forget the patient who, through the local physician, is in reality counselled to be neglected and to be continued in his suffering. This favorite expression is "it will do harm," but what conceivable harm it could possibly do to let the oculist try, they never explain. If there are only a dozen instead of thousands or millions of patients needlessly suffering from migraine and other eyestrain effects, then the many cases in which the oculist fails are not "harmed" much or any, and the dozen cured are no longer an "opprobrium of medicine." Is it not worth while to cure the twelve? How could they be cured except by making the test? There is, indeed, a negative exaggeration, a minus enthusiasm operating "inversely as the square of distance," which far more than counteracts the plus exaggerator. This sort of conservatism is active against every discovery and is a great brake on the wheels of progress.

But when the exaggerator is finally found to be

right the grudging admissions previously muttered in parenthesis and aside permit the man at the brake to cry, "I always said so! I pulled the wagon!"

From the mouth of the discriminating scientist the counsel of perfection against misstatement and exaggeration comes with grace and must be received with graciousness. But from the editor of a house-organ "medical" journal one naturally gives it scant courtesy. The sale of one's professional service as a figure-head to enable mercantile firms to make money out of the profession's disorganization and affliction does not encourage confidence in the editorial science or ethics. When medical men become organized they will not donate forever out of their control their literature to commercial firms which by the gifts make immense wealth, while the writers remain as poor as ever. It is precisely these editors of these journals who misquote and lie about those of whom they do not approve.

If you do not "train with the crowd," if you do and not buy the special brand of secret nostrums, or of books, etc., advocated by the editor, or by his manufacturers and publishers, it will be impossible to get any sort of justice done or errors and misrepresentations corrected. The most glaring and wide-of-the-mark misstatements and misquotations, instead of being corrected, will be repeated and added to. Point out to the rabid editor these "errors" and he will not

publish your statement and certainly not acknowledge his "mistakes." You have never implied that more than a small percent of insanity or epilepsy is due to eyestrain, you may have only suggested that criminality may be due to that cause, and yet these editorial and review writers will unblushingly tell their readers that you say all crime, all epilepsy, all insanity, etc., are caused by lack of a pince-nez. The book reviewed may contain the clearest cautions against exaggeration, may expressly state the "mays," "the small proportion," "the minority of diseases so caused, etc.," it matters not. "Any club to hit a mad dog!" I never yet succeeded in getting but one editor to acknowledge a misstatement of this kind. He had said I claimed that eyestrain was the cause of cancer. He finally confessed that this error was entirely a product of his imagination. But this model man was not the editor of a "house-organ."

When the real question reaches conscience, as to "exaggeration" it must of course be scrutinizingly considered, even though the questioner is interested not in the patient's sufferings, or in the fundamental truth of the matter. Accuracy of statement is so important that its want will excuse neither *tu quoque* nor over-enthusiasm. But it is evident that it can be decided only by testing and by the verdict of posterity. Neither asseverations of the enthusiastic nor denials of the conservative settle the doubt. All that the

affirmer wishes is to get the denier to put the matter to the test. The clinical test is the only one in medicine. Have these patients been carefully tested by a believer in the eyestrain theory, one who has his reputation to lose if he fails? Only then will the truth or error of the theory be demonstrated.

The critic who answers all argument by charges of "exaggeration" and "hobby-riding" relies usually on "the consensus of opinion of the leading authorities," in other words, appeals to established belief, prejudice, in short, to back up his charge of "overworked theory." And it is precisely authority which the truth-discoverer disallows. He looks into the history of every discovery of medicine and science and finds the established opinions have been erroneous or incomplete. How could it be otherwise? If the existing doctrine were true, what need or right would he have to supplant it with anything else? "Established opinion to the dogs!"—one almost says. The existing "authority" must be wrong if new truth is to be discovered, if progress is to be achieved, and unless all truth has been attained, and all error annulled. Huxley admirably stated this position when he wrote:

"The improver of natural knowledge absolutely refuses to acknowledge authority as such. For him skepticism is the highest of duties; blind faith the one unpardonable sin. And it cannot be otherwise, for every great advance in natural knowledge has involved the absolute rejection of authority. the cherishing of the keenest skepticism, the annihilation of

the spirit of blind faith; and the most ardent votary of science holds his firmest convictions, because his experience teaches him that whenever he chooses to bring these convictions into contact with their primary source, Nature—whenever he thinks fit to test them by appealing to experiment and to observation—Nature will confirm them. The man of science has learned to believe in justification, not by faith, but by verification."

Personally I may differ from many who believe in varying degrees in the theory as regards the extent to which migraine, headache, digestional and assimilation diseases, etc., are due to ametropia. Unless those disagreeing have had an oculist's personal experience with something like ten thousand such cases, they are not so well fitted to judge as I. If they rely on the authority of neurologists and psychiatrists, their reliance is upon nonexperts and is misplaced. If they rely on the authority of old-fashioned ophthalmologists there are several answers, among which are these:

1. There are at least seventy-eight reasons why glasses fail to cure—the first being that the disease in question may not be caused by eyestrain. But there are seventy-seven others which pertain to the demonstrated and admitted carelessness in making refraction tests and in prescribing glasses and in watching the patient afterward. Most of the seventy-seven requisites are habitually disregarded by the majority of the oculists of the world. Most of them are openly scorned by the criers of exaggeration. It will not do to say, as does Dr. Shrady and Dr. Sachs, that

the seventy-eight reasons are evidence of a "hedge," of being "driven into a corner," etc., for these seventy-eight reasons are the conditions of accurate refraction, the *sine qua non* of the tests, without which the glasses might as well be worn before the mouth as before the eyes.

2. Chief among the reasons is the neglect of the principal condition causing eyestrain on the part of the great majority of oculists of the world. This is the small error of refraction, and the methods and carefulness necessary to diagnose it with that accuracy which alone can cure. Good oculists well know that it is precisely these low and unsymmetric astigmatisms which are the most certain provokers of such systemic reflexes as headache, sick-headache, denutrition, dyspepsia, morbid nervous phenomena, etc. Donders taught the neglect of these low errors of refraction, and the ophthalmologic world has strangely persisted in an error which accurate physiologic and optical knowledge, as well as closely observed clinical facts, would have detected. In a recent number of the *Lancet* the editor acknowledges that the English ophthalmologists still usually continue their indifference to the low error. A noteworthy illustration was given at the last meeting of the British Medical Association. Dr. Clarke, of London, epitomized his experience of twenty years in the treatment of myopia. He fully corrects the myopia; he does not correct astigmatism

of less than one D., unless it would improve vision; he allows no reduction for near work from the "fully corrected" myopia; he thinks that excessive convergence is the main factor in increasing myopia. A more perfect combination of malobservation, poor logic, wrong views, and bad practice could hardly be found.

3. The oculists who contend, for instance, that migraine is not due to eyestrain, speak, of course, from their own clinical experience. A greater number of good oculists say that migraine is, in their experience, frequently cured by glasses. The first class are thereby convicted, and self-convicted, of unskilled work. Negative testimony, alibis, etc., counts for little in law and for nothing in medicine. What sort of a physician is he who says migraine is generally, or even always, curable, and then when thousands of migrainous patients come to him he cannot cure them? How long would such an oculist have any professional reputation or practice left? The patient-world of reputable oculists is not so stupidly foolish as that.

A great physician famous in America and Europe writes criticising nothing else except the advice that *all* children should have their eyes tested by a competent oculist. And yet he advises that whether they have toothache or not their teeth should be examined by the dentist! The ocular examinations are now advised by most physicians. The diseases due to the eyes

are so subtle, so varying, so multiform in expression, and the organs affected are so remote from the eyes, that it is of the highest importance that the evils should be prevented by this simple method.

Another reviewer says the ametropia is due to the same cause as the neurasthenia, migraine, etc.—an error which could only arise from an ignorance as to what astigmatism really is, and a return to the old fetiches of the neurologists,—a “neuropathic tendency,” a “morbid predisposition,” “degeneracy,” etc. Even admitting the fun and nonsense of the view that corneal curves and ocular measurements are produced by headache and vomiting, that does not lessen the duty of attempting to discover the cause of “that disease (migraine) whose nature is unknown” (Osler). The “neuropathic predisposition” is the ultimate reliance of the hard-pressed neurologist. Upon that die his whole scientific fortune is staked. Well, then, he is certainly doomed to bankruptcy! For a capable refractionist could make a great reputation and income if he could be allowed his way with the neurologist’s patients before they consult him, or even afterward. There would certainly be an end of many rest-cure establishments, private hospitals, and sanitariums.

Two reviewers have affected to speak as defenders of the sacred medical profession against the criticism that some of its members have been in the wrong in opposing new medical truth. These self-appointed

defenders of the faith jauntily mounted their Rosinantes and cantered forth to what they thought an easy victory. The truth of the matter did not concern them. Theirs was the cheap bravado of men with a disciplined army behind them and a supposed poor Falstaffian rabble in front of them. But they faced the wrong direction. It was wrongly thought to be war, and it was very far from magnificence. It was mock-heroism and pseudoprofessionalism. There proved to be no Falstaff, no enemy in fact, and Rosinante was put back in the stable, while badges commemorating the *Defenders of the Faith* were being made. The medical profession, I admit, is the best of all, and there are more noble-minded and clean-hearted men in it than in any other. But there are others of very different character. And all of us are human, quite prone to occasional error and sometimes even to sin. It is a sacred calling, but those who think it so must avow and disown its sycophantic parasites who flatter its vices and perpetuate its errors; who encourage the seekers after offices and consultation practices, and who care far less for medical truth than they do for personal success.

As I write an excellent illustration comes to my hand of a certain condition of mind and of the methods of expressing it.¹ I had just been treating a patient who

¹ In the spring of 1904 were published articles showing the origin of probably the larger proportion of all cases of spinal

had been under the care of an orthopedic surgeon of national fame. When I tested the eyes, I found the girl's astigmatism in the dominant eye was 15° and in the nondominant it was 180° . I called the parents to one side and told them that in the vast majority of cases with such axes of astigmatism there was generally found a tilting of the head to one side, an elevation of one shoulder, etc., from childhood, with resultant spinal curvature. I asked if this girl (of 18) had not inclined her head to the left, elevated the right shoulder and if she had any spinal curvature. Then came the family tragedy! The child had done as described from the age of eight, and had been under the care of the great Dr. ———, and of others, with daily devotion to physical culture methods, for many years. Spinal curvature was also said to have been inherited by her, several ancestors and relatives having had it. I at once wrote to the orthopedic authority, saying that I had discovered, I thought, the cause of his patient's scoliosis; I set forth the details, and supposed that he would be glad to learn of the, at least, possible new truth. The following was his reply:

"I have your letter and clipping and thank you. Yes, I read your paper when it was published and I have a vague curvature in a peculiar axis of astigmatism which forces the child to hold the head to one side. Many months later great "medical journals" had not thought best to tell their readers a word about this highly important fact.

memory of some previous one. At the time I was tempted to write on scoliosis as a cause of unsymmetric astigmatism, but I feared to touch a sore place on your back, and out of pure love held my pen.

"As to my patient, of which you speak, the parents have *not* done everything they could for the scoliosis. The child's Latin was far more important to them than her scoliosis. And I am quite sure that the cause of the unsymmetric astigmatism is the cause of the scoliosis, and not the astigmatism the cause of the scoliosis, or the scoliosis the cause of the astigmatism. With a bald father, who is a clergyman, and who has sufficient money for unnecessary charity and insufficient to pay half rates for treatment of his child; who does not pay what he has promised to pay. With a fat mother who talks your arm off, and whose parents were mentally and physically defective, one may naturally expect in an *only* child very marked evidence of degeneracy. And you have the eye defect, the scoliosis, weak feet and fat.

"Why do we find such a large percentage of scoliosis among the children of clergymen and Jews? I believe it is degeneracy. What percentage of your cases of unsymmetric astigmatism have scoliosis?

"If there is an eye man that you can interest in your theory I will send him abundant scoliotics for examination if he will send me an equal number of unsymmetric astygmatics for special examination.

"Yours truly,
"_____,"

This is delightfully naive! It reminds one of Lincoln's saying about fooling some of the people all of the time, etc. Some "scientists" can not be fooled any of the time.

1. Here is a man who stands at the head of his

specialty and yet who knows so little of astigmatism that he does not know how to spell the word itself, in a hand-written letter.

2. He misreports another orthopedic surgeon atrociously (in a subjoined abstract) as an ignoramus in his specialty, and then abuses him, saying that "he knows very little about lateral curvature of the spine."

3. He has not the faintest idea of what I have suggested as the cause of many of these cases of scoliosis. He traces it to "unsymmetric astigmatism," but it is in fact due to only one rare variety of unsymmetric astigmatism. The vastly greater number of cases of unsymmetric astigmatism could not possibly produce tilting of the head, and he does not know that the eye-strain of others, previously suggested as a cause of scoliosis, is an utterly different thing from that I have described.

4. He has not the least conception of what astigmatism optically and anatomically really consists. The idea that scoliosis or "degeneracy" could produce malcurvature of the cornea, would make the whole ophthalmic world break into derisive laughter.

5. When a crude mind cannot remedy a fault of temper or discover the cause of an obstinate disease, it tends to blame some one else. The attitude of scorn and contumely for a patient who persists in not being cured is, of course, highly justifiable, but it does not help matters "at all, at all." This hauteur is as ridic-

ulous as it is unscientific; as self-stultifying as it is unkind. There are few patients who really "enjoy bad health," and who are contemptible "hysterics" and despicable "degenerates." They usually wish to be cured, and would be cured if we physicians were able to find the cause of their diseases. The physicians who thus speak contemptuously of patients—in the "God and a black-beetle" style—are those who not only do not know the cause of the functional diseases they cannot cure, but who also scorn the new views which might explain their causes.

6. The modern god of the neurologic and psychiatric nescience is "degeneracy." He is a poor graven image at best, and of the barbaric type. His supposed existence explains nothing, and moreover he really does not exist. It would be sad indeed if Nordau and Lombroso were even the "most minor of minutest" prophets of evolution. The "stigmata of degeneration" of some modern pseudoscience will long be a mirth-provoking subject for those with a genuine sense of humor. In the present instance, it seems that, Nordau and Co. have forgotten some of the principal evidences of "degeneracy," *e. g.*, in the father—baldness; being a protestant clergyman; the possession of some money coupled with personal preferences as to charity; half-rates; nonpayment of debts. On the part of the mother, loquacity; defects of parents (diagnosed as such by the scorer). On the part of the

child, being the only one; unsymmetric "astigmatism;" scoliosis; weak feet; fat. (The girl is 5 feet 5 inches high, and weighs 145 pounds.) On the part of the world, degeneracy is due to being the children of clergymen and of Jews.

7. The reenactment of the old historic worn-out farce is exemplified admirably in this gentleman's attitude of settling the whole matter adversely, and with scorn or with kind and supercilious silence, when any new thought is suggested as to the origin and cure of an admittedly inexplainable disease—and in a special case in which there has been no cure, although the parents seem to have done too much rather than too little in their long and earnest attempts to cure the child.

In a rough way, therefore, those opposed to new medical truth may be divided into three classes: (1) Those frankly and publicly opposed; (2) those who cry "exaggeration"; (3) those who are silent. Those violently against are the crude, dogmatic minds, incapable by nature of seeing or doing much for the progress of science or the good of their fellow men. They have the single merit of a partial frankness, and their bigotry in the long run helps the cause of truth some in calling the attention of a certain class to their extremism. The criers of exaggeration are more harmful by their plan of damning with faint praise and thus aiding the lazy to be more indifferent. The

silent men are the worst enemies of progress. The silent leader, whose silence is motivated upon a cunning selfishness, is the most guilty of all the murderers of new truth. In every city there are several or many "leading physicians" (general physicians and neurologists) looked up to, and their advice followed by their pupils, and by the rank and file of the profession. By their professorships, hospital and society positions, text-books, etc., they have secured and accepted their oracular and judicial powers. They control the minds of many others who are trying to secure such a future standing for themselves as the master now has. For twenty or thirty years these men have had placed before them the abundant clinical evidences and testimonies of reputable men, that eyestrain does produce varied and profound systemic symptoms and diseases. Not one of these authorities has done any frank, judicial weighing of the matter; not one has publicly stated his opinion. There is no evidence that one of them has thought it worth while to test its truth or falsity, or even to say that it should be tested. If it is wholly false they should have said so; if it is in part true, they should have said to their followers and pupils just how far they were prepared to assent and advise trial; if it is in part true, thousands of patients have been condemned to nonrelief by the silence. Not one has publicly stated that the cure depends upon at least seventy-seven reasons, usually

neglected by most of the oculists of the world. The opinions, concerning this subject of several of these silent men, are known to me. I have their letters or word-of-mouth consent to the essentials of the contention I and others have made. But I am not permitted to name these men, nor to quote from their "confidential" admissions. In fact, even under the condition of "confidential communications," they would, perhaps, not consent to all that the eyestrain theorists have advocated.

They affect to think that we have gone a hundred times farther than we have really gone. Their mental vision is fixed upon an abstract scientific fact, forgetting that in medicine all is concrete and individual, and that neglect of a possible method of cure shows indifference to the sufferings of patients. One of the most well known of American physicians verbally confesses that the eyestrain advocates are "essentially right." He admits many marvellous cures by glasses of many and varied systemic conditions, but to say that "all and always such diseases are due to eyestrain, etc., No!" "No one ever contended they were," brings only continued public silence. Another has for a dozen or more years referred such cases, hundreds of them, and still does so, to one oculist after another, until the careful one is found who finally cures. He admits again "essentially" all that the most extreme of oculists would ask for—but he admits it only priv-

ately, when even the most modest public admission would immediately bring the matter to the test in a multitude of cases under the care of those who follow his advice. They continue unrelieved while even he admits that the trial of glasses would not do that strange mysterious "harm," so feared by many. Drugs, rest-cures, trips abroad, and a hundred devices of therapeutists of as many types—they do no "harm," but trying a pair of glasses is somehow dangerous, most dangerous, advice!

It is a strange condition of mind, one, however, not inexplorable, one wholly unworthy of the positions these men occupy. It is in truth the logical, though callous, result of these positions—the effort to hold them or to secure higher ones. Perhaps the condition will pass away only with the better education of the profession, which will make a far larger number of men the equals of the "leaders"; then a justifiable individualism of the many will do away with the absurd dependence upon the authority which makes the public clamor for "the best and most famous consultant in _____."

Let it also be recognized that in science, and especially in medical science, the self-assumed leaders who oppose new truth are criminals. It is time that we were frank and blunt about it. The illiterate may ignore without blame. A few medical men, even the mass, may also ignore, and deserve only a moderate

censure. None, absolutely none, may oppose and denounce and vilify. Who does so of medical men is culpable.

But when leaders and authorities do this it is plain homicide, murder, at least in the second degree. For the function of a leader is precisely to judge rightly of just these things. For that he is looked up to and his advice followed. This is the office he arrogates to himself; it was not thrust upon him; he assumed it, and the assumption was a guarantee, under penalty of fitness, culture, learning, experience and just judgment. He was under no obligation human or divine to render adverse judgment and to persecute. Wherever there is great power lodged in a man's hands, its bad use is or should be punished. We need a machinery to punish these false judges. Monuments should be raised to commemorate their shame, their vulgar egotism, and their professional crimes. It matters not to the patients dead of neglect and false judgment, whether it was homicide or murder of any degree, but to society and to the profession, it does matter. Who killed the thousands of mothers who needlessly died of puerperal fever, the millions who died of smallpox, after Holmes and Semmelweiss and Jesty and Jenner had demonstrated the truth? There are to-day several millions of people as needlessly suffering the agonies of migraine: who are responsible? The names of a hundred learned editors, neu-

rologists, oculists and "leaders" in medicine could be given.

Although the scoffers and critics fill the public ear with their clamor it is quite probable that at the present time the believers in the eyestrain doctrine are more numerous and certainly more discriminating and modest, more truly conservative, in stating their belief than the deniers. References to only a few of such testimonies happening to be present are the following:—Dr. Snell, of Sheffield, England, in a masterly article in the *Lancet*,¹ improved and enlarged and published as a separate volume, entitled "Eyestrain as a Cause of Headache and Other Neuroses";² Pronger, "Slight Errors of Refraction and Their Influence on the Nervous System";³ Browne and Stevenson, "Squint Occurring in Children";⁴ Callan, "Migraine and Functional Headaches from Eyestrain";⁵ Thomas, "Some Remote Effects of Eyestrain";⁶ Stephenson, "Ocular Headaches";⁷ Zimmermann, "Ocular Headache and Other Ocular Reflexes";⁸ Harman, "Head-

¹ *Lancet*, April 30, 1904.

² Simpkin, Marshall, Hamilton Kent & Co., Ltd., London, 1904.

³ R. Ackrill, Harrogate, 1904.

⁴ Bailliére, Tindall & Cox, London, 1904.

⁵ *Journal American Medical Association*, March 28, 1891.

⁶ *Northwestern Lancet*, June, 1903.

⁷ *Medical Press and Circular*, February 4, 1903.

⁸ *New York Medical Journal*, November 21, 28, 1903.

aches";¹ Hinchelwood, "Some Observations, etc.";² Toms, "Eye-work in General Practice."³

A hundred other references might be cited if space permitted. I add a few quotations from some recent good journals and capable ophthalmologists and physicians: Dr. E. Jackson,⁴ Dr. Robert E. Edes,⁵ Dr. W. F. Southard,⁶ *The Pacific Medical Journal*, Dr. H. M.

¹ *The Medical Press*, November 18, 1903.

² *Glasgow Medical Journal*, January, 1904.

³ *Medical News*, November 3, 1900. Also another article entitled "Ocular Reflex Neuroses" (abdominal types)—the reference to the journal unfortunately lost.

⁴ If the reader is familiar with what eyestrain can do, and does do, in the way of curtailing usefulness and destroying the pleasure of living, let him fairly ask whether many of these symptoms may not have been due to eyestrain? Whether it is not probable they were due to eyestrain. Whether, although the eyestrain explanation has been offered by Dr. Gould, we are not forced to admit that the only alternative to its acceptance is to relegate these cases to the mysteries of Providence, or the unknown regions of neurology, and attempt no explanation of them whatever?—*Colorado Medicine*, Dr. E. Jackson, March, 1904.

⁵ The ciliary is the purest type of such a muscle and undoubtedly its overaction, and especially its action which accomplishes its object for a time and with much difficulty, is the cause of more headaches than that of any other one.—Dr. Robert T. Edes, *British Medical and Surgical Journal*, March 3, 1904.

⁶ There is no specialist who has kept an accurate record of his cases for a series of years but will bear Dr. Gould out in his conclusions.—*Pacific Medical Journal*, April, 1904.

Hurd,¹ Dr. James W. Walker,² *The Cleveland Medical Journal*,³ Dr. Frederick E. Cheney,⁴ *The St. Paul Medical Journal*,⁵ Dr. L. A. W. Alleman,⁶ Dr. W. H. Car-

¹ You have already made a deep impression upon the professional mind and I am sure you will reap an abundant reward in the consciousness that from now on all physicians will recognize the truth of your contention.—Dr. H. M. Hurd, Baltimore.

² As a general practitioner I can say that the judicious employment of an expert refractionist will rob the practitioner of many of his chronic cases, and in place of fees he will have to be content with gratitude,—if the oculist does not get all of that. Our duty, however, is none the less clear.—Dr. James W. Walker, *Journal American Medicine*, March 28, 1903.

³ A distinct service to the profession at large.—*Cleveland Medical Journal*.

⁴ As to sick-headaches I certainly expect to cure the greater proportion of them.—Dr. Frederick E. Cheney, Boston, personal letter.

⁵ That headache, insomnia, night terrors, nervous dyspepsia, sick-headache, migraine, and a host of other similar symptoms result from eyestrain, and are relieved by proper glasses, every physician and especially every oculist, is well aware.—*St. Paul Medical Journal*, March, 1904.

⁶ The lesson you are trying to teach the public is a much needed one, and the discussion to which your work has given rise has done more to enlighten the general public on the danger of eyestrain, which is not necessarily evidenced by eye-symptoms, than all the papers that have been written.—Dr. L. A. W. Alleman, Brooklyn.

malt,¹ Dr. A. G. Bennett,² Dr. S. D. Risley,³ Dr. Talcott Williams,⁴ Dr. N. Senn,⁵ Dr. Solomon Solis Cohen.⁶

¹ What ophthalmologist has not had the same or similar experiences?—Dr. W. H. Carmalt, New Haven.

² Heartily endorse your conclusions.—Dr. A. G. Bennett, Buffalo.

³ I can't see how any experienced ophthalmologist can fail to agree with Dr. Gould's thesis.—Dr. S. D. Risley.

⁴ It is a mystery to me why doctors do not see what is so plain.—Dr. Talcott Williams.

⁵ Nothing has done more toward calling the attention of the profession and the public to the baneful effects of eyestrain than these two books . . . I have finished reading your wonderful book; I was so fascinated with it that I could not stop until I had read it from cover to cover. I have written and sent to the editor of the *Journal American Medical Association* a three-page review. [Not published.] I hope the book will reach every doctor in the world.—Dr. N. Senn, Chicago.

⁶ The dependence of migraine upon eyestrain as an exciting cause in a large number of cases can no longer be denied by the most doubting Thomas. . . . Unquestionably it is a truth of vast significance. Unquestionably physicians have not yet fully realized that significance.

Dr. Gould's great merit lies not so much in his individual theory of the causation of migraine as in his directing strongly the attention of the medical profession, and it is to be hoped of workers in literature and science who are not physicians, to the necessity of the relief of eyestrain by suitable glasses, with recorection from time to time, as the refraction alters and the reflex disturbances recur; the other, and in some respects greater, being the importance of gathering all facts concerning the ill health of any individual into a comprehensive whole, rather than to consider detached fragments as things utterly apart. As the writer has elsewhere expressed

Quotations might be added from letters of the following physicians:—R. Matas, E. Souchon, W. S. Halsted, J. S. Prout, H. O. Reik, C. E. Ehinger, S. C. Ayres, Russell Murdoch, David Coggin, H. G. Sherman, W. F. Southard, H. F. Hansell, John Van Duyn, H. L. Swain, T. D. Crothers, T. H. Fenton, A. B. Adams, Peter A. Callan, Wm. H. Welch, Lewis H. Taylor, Mary E. Bates, A. A. Eshner, W. C. Hollopeter, Baker (of Cleveland), Geo. F. Libby, F. W. Marlowe, Geo. F. Case, J. W. Putnam.

Reviews accepting the eyestrain theory and favoring

the same thought, "the spokes are many, but the hub is one." This method applies indirectly even to pathologic accidents such as acute infections, but its direct bearing is of course upon what may be termed the basic condition of health or disorder.

Dr. Gould has shown that much, if not all, of the constant or recurring distress of a number of the leading spirits of the nineteenth century—distress otherwise mysterious and unaccountable—was in all probability due to refractive defects of the eyes and the consequent accommodational strain made necessary during work. It might, therefore, have been relieved in large part, if not entirely, by suitable glasses; and, this is the great, but therefore simple, lesson for physician and for patient. In emphasizing this lesson the author has emphasized old and unappreciated truth; he has also added to the sum of truth. It is a work well worth the doing; a work certainly not inferior to the invention of a new staining fluid, the synthesis of a new hypnotic drug, or the description of a new symptom-complex; a work of which the true value will become more apparent as the years increase.—Dr Solomon Solis-Cohen in *Science*, April 29, 1904.

the general view have appeared in *The Harvard Graduates' Magazine*, *Bulletin of the American Academy of Medicine*, *Fort Wayne Medical Journal*, *Medical Review of Reviews*, *Canadian Journal of Medicine and Surgery*, *California Medical Journal*, *St. Paul Medical Journal*, *Dublin Medical Journal*, *Medical Press and Circular*, *The Lancet*, *Bulletin of the Chicago Health Department*, *Medical Bulletin*, *The Practitioner*, *The Nation*, *Cleveland Medical Journal*, *Quarterly Medical Journal*, *Wisconsin Medical Recorder*, *California State Medical Journal*, *Medical Council*, *Mind*, *The General Practitioner*, *Treatment*, etc.

Especially would I call attention to the opinion of one who has for about half a century been one of America's leading refractionists, an honored physician of St. Louis, the dean, one might say, of the oculists of our country, Dr. John Green (quoted on pages 55-58).

1

1

PROBLEMS OF PRESBYOPIA.

CHAPTER XIII.

SOME PROBLEMS OF PRESBYOPIA.¹

WHEN I began practice I did as I had been taught regarding the correction of presbyopia. Text-books, teachers and general custom agreed that presbyopia began some time after forty, and that no mydriatic was needed in such patients. There was a rough rule wandering about that plus spherical lenses of one diopter were needed in forty-five-year-old patients, twos at fifty, threes at sixty. This was about the time of the "Punch, Brother, Punch with care, a blue slip ticket for a five-cent fare, etc." Actual dealing with presbyopic patients soon brought me up sharp. Rules like those of the street-car conductors would not work out in the oculist's office. If any rules at all were admissible they had to be of a different kind from those of the text-books; in some ways far more definite, in others more indefinite. Some of these cautions I have brought to clearness are as follows:

1. In oncoming and progressive presbyopia, cyclo-

¹Read in the Section on Ophthalmology of the American Medical Association, at the fifty-fifth annual session, June, 1904, and published in the *Journal* of the Association January 21, 1905.

plegia is generally necessary to obtain the static refraction on which the presbyopic correction is based.

Precisely in eyes whose accommodation powers is being narrowed and lessened is the mydriatic most needed in order that eyestrain may not be increased by the close limits in which function is being compressed. When there is youth and a high range of accommodation the refractive error may not produce the injury taking place in the presbyopic. This is a truth so self-evident that it is astonishing to find it utterly ignored in Europe and too commonly ignored in our country.

The slightest misplacing of the axis of astigmatism, the failure to get the accurate amount of the error of refraction, the least imprecision in correcting the slight anisometropia, insure more trouble in the presbyopically lamed eyes than in others with plasticity and with activity of neutralizing or compensating powers. If there are symptoms of eyestrain, and especially if accompanied with any doubts in my mind as to accuracy, I do not hesitate to use a mydriatic up to the ages of fifty-five or sixty. I think almost all patients up to fifty should have it. I mean homatropin and cocain and instilled in the office.

Discrimination as to those with latent or manifest glaucomic tendencies is, of course, demanded. The individual expertness of the oculist must also be considered. The art of refraction requires a skill, a judgment and a delicacy of perception, as great and rare as in

any other calling, greater, I believe, than in surgical or inflammatory conditions. A highly exceptional mastery of the art may succeed in estimating the error of refraction without a mydriatic when others would fail. None may safely lay claim to such ability. None, at least, may safely trust himself in its habitual employment. Easy-going assumption of it is another phasing of the characteristics which have duped us since proverbs and folk-tales and the ophthalmometer were invented.

2. The age at which presbyopic corrections should first be given depends on the preexisting refractive error.

The old rules as to forty-five, etc., are nonsense. If the patient has two diopters of hyperopia, the presbyopic correction will be needed much earlier than if he is emmetropic. If he has myopia, the necessity will arise later, as is well understood. But astigmatism creates a greater indefiniteness, and especially if it is unequal or if unsymmetric. Anisometropia further complicates all rules and makes them still more indefinite. The onset of troublesome presbyopia also depends on whether the ametropia has been corrected or not for years previous.

3. The correction of the presbyopic error of one or both eyes is often dependent on the existence in one eye of amblyopia from disuse.

This exclusion of one eye from function always

brings most difficult problems. If of high degree and of long standing it may not be possible to get reaction or to stimulate the lost power into function. As a rule I believe in saving partially ruined eyes, and it is possible to do so more often than has been supposed. Such eyes exist far more frequently than text-books and teachers tell us about. In some rare cases at the presbyopic age the attempt to save the eye and bring it into function is not only possible, but will produce most decided rebellion on the part of eye and brain. These "hurt eyes," with stippled maculas which let you stare at them, and which so plainly show neglect and sin, both lay and medical, are daily visitors to the oculist's office and they make his hair gray sooner than should be.

4. Less accommodation in one eye than in the other may condition the amount of the presbyopic correction.

This inequality of function may be the result of anisometropia, of right-eyedness or left-eyedness, of a peculiarity of occupation, of monocular disease or injury, of heterophoria, etc. It is of more frequency than is suspected, and causes much ill-success in the correction of presbyopia.

5. The onset of presbyopia demanding correction may be delayed beyond the usual age by hypertrophied accommodation.

This abnormalism of excessive accommodation is the result of lack of presbyopic lenses, with the resultant

over-function of the ciliary muscle and abnormally retained elasticity of the lens. Excessive use of any organ, or abnormally prolonged use, produces disease. That of the accommodation in presbyopia causes eye-strain and all of its reflexes. The eye itself or the organs which bear the brunt of the derouted reflexes must suffer. I have heard of one oculist who attempted for many years to postpone presbyopia requiring correction into old age. That is a human vivisection experiment that would be somewhat interesting to science, but which I should be far from wishing to try in my own case. We see daily the injury and the suffering it causes in old people who indulge in the puerile vanity of ability to "read without glasses." The result is that they do not read much, their little intellect goes to seed, and the little reading they do produces disease.

6. The correction of presbyopia at an early or late age and the high or low degree of the error depends on the amount of near work demanded of the eyes.

In nonreading farmers, workmen, seamen, etc., the correction is not required to be made at so early an age, nor perhaps in so high a degree as in sewing-women, literary people, engravers, etc. A hurried test may also result in a too low correction, because the accommodation by a moment's intense effort may prefer a lower lens than would be required in more prolonged use of the eyes at near range.

7. Presbyopes who deceive the oculist as to their age may suffer if he has not been alert minded to detect the error.

One must be on his guard in treating "women of doubtful age."

8. The peculiarity of the habitual occupation may necessitate a higher and earlier correction than is usual.

Embroidering, "sewing on black," engraving, watch-making, measuring in sixty-fourths of an inch, etc., are kinds of employment that make inordinate demands on the accommodation.

9. The light, its quality, power, etc., must also be inquired into.

If a patient works all day by artificial light, or by poor daylight, in darkened rooms, if the angle at which even a good light strikes the work is not right, eye-strain is sure to result. If after a long day of strain, under these hurtful conditions, reading, sewing, etc., are continued at home, and again, perhaps, with bad lights, the results must be deplorable.

10. The position of the body and head in sewing, reading or other near work may be harmful to the eyes and the general health.

If the book, sewing material, writing, etc., is placed in the lap, or in such a position that the head is bent over, the spine curved, and the chest flattened, the injury to the patient's eyes is almost certain because of nonillumination of the page, paper, etc., and also

because of the improper position of the eyes and head. The health generally must be harmed by the compressed condition of the pelvic organs and the lungs, poor respiration, etc.

Bookkeepers, etc., should stand at their work as much as they may, and chairs at desks should be low, the desk high, the writing leaf inclined, the axis of vision as nearly as may be perpendicular to the plane of work and of the spectacle lenses. The single disadvantage of the bifocal lenses is that they compel the axis of vision to be inclined downward. For this reason they should be set high before the eyes, and the habit advised of "chin-up." Book rests, book holders, etc., should be encouraged. In my boyhood "sewing-birds" screwed to tables were common. They were most excellent devices.

II. The state of the general health, the preserved vitality, the vigor of will and of body, will also condition the early or high correction.

A flaccid muscular tone, anemia, denutrition, care and worry, a melancholic or pessimistic disposition or philosophy of life may not be entirely overlooked. Patients so handicapped require a fuller or earlier presbyopic correction than those who are more vigorous. Their innervational power is lessened and sometimes nothing the oculist can do will enable them to carry on severe near work when presbyopia doubles their strain.

12. Failure to cure the reflexes of eyestrain may be due to the want of bifocals.

Two separate pairs of lenses can not correct eyestrain as do the double lenses. With a distant pair only there is an hour or more of strain every day in eating meals. There is also forgetfulness to change or indifference to the need of it, lenses are not repaired, are misplaced, or lost, etc. The one disadvantage of bifocal lenses is counterbalanced a hundred times by the manifest benefits over the distant and near glasses made separate.

13. Eyeglasses being more prone to maladjustment than spectacles may be the cause of failure to bring relief of the symptoms or sequels of presbyopic eyestrain.

There are few noses capable of retaining bifocal eye-glasses in a correct position. The more expert the optician the more the attempt may be tried. This is especially true if the patient can consult the fitter at least once a month. Patients who by reason of living at a distance can not do so should not be allowed bifocal eye-glasses under any circumstances. To those with high degrees of astigmatism they must also be forbidden, except for one nose in ten thousand. Vanity causes a deal of suffering both to patient and oculist. It may prevent the patient wearing any glasses and thus double the local and systemic reflexes. When, as usual, vanity demands eye-glasses, and the result is

certain to prove bad, my custom is to tell the patient to consult another oculist. No greater ill fortune could happen to your rival than to have the patient go to him. And there is no better punishment for vanity than eye-glasses, unless it be the rest cure.

14. Premature presbyopia, or paresis of the accommodation, may occur years before the usual age, and explain failure to relieve symptoms when none of the preceding causes will do so.

The patient may have contracted a chronic habit of reading at too great a distance and the presbyopic lenses ordered may force him to hold the page or sit at writing at a shorter distance than is comfortable or perhaps best.

This is especially true if there is exophoria or insufficient adduction power. If this is so, the adduction should be increased until comfort is secured, habitual reading or writing at, say, twenty inches may itself be a source of eyestrain.

16. The patient may have supernormal adduction power and the presbyopic lenses ordered may force him to read or write at too short a distance.

In this case, at least until the adduction lessens, the too weak lenses may cause discomfort.

17. The symptoms may not be due to presbyopia, nor to any eyestrain, but to systemic disease.

Every oculist has had many patients whose symptoms had been treated by glasses alone, or whose

ocular muscles had been "clipped," when all the time there was concealed or unknown systemic disease, *e. g.*, nephritis, diabetes, anemia, etc., or some morbid result of bad dietetic or other habits, which were the only or chief causes of trouble. This does not in the least excuse those wonderful oculists who find that all eye-strain symptoms and reflexes are due to systemic conditions. That is a good way to please the referrer of cases, and to conceal inaccurate refraction. But it is not the best way to practise ophthalmology.

The preceding rules are, in fact, non-rules; they are in truth, cautions to have no rules in correcting presbyopia. Every case is exceptional and individual and requires a freedom of the mind from bias or prejudice of any kind. Precision in estimating the conditions, infinite patience, delicacy and conscientiousness, in hunting out the individual variation there before one, and inexhaustible ingenuity in meeting all the varied and varying phases and factors, are the prerequisites.

There is but one invariable rule: Have no rule. Rules are the makeshifts of the lazy and unintelligent. The cunning rely on them, forgetful that cunning is really stupidity. Optical machines are often rules made into iron rods, scales and wheels. They may be of service if used not as dictators but as slight helpers, in the hands of the intelligent and guiding machinist, but they may serve as the excuse and ruin of those

who rely on them to the exclusion of intelligence and diagnostic skill.

Any number of cases could be epitomized, illustrating the foregoing suggestions. I shall content myself with but few, because in every oculist's memory there doubtless arises plenty of examples.

Case 1.—A lawyer who carried on a tremendous amount of eye work had an enormously high and complicated compound hyperopic astigmatism. Despite a perfect correction of his ametropia by capable and good oculists, and despite the best treatment by general physicians, his dyspepsia persisted. In obedience to his demand his oculists had allowed him to wear bifocal eye-glasses. A difference of five degrees or ten degrees in his astigmatic axes, inevitably caused by maladjusted eye-glasses, rendered his ametropic correction worse than useless. They failed to cure their patient because they did not demand spectacles.

Case 2.—A woman of 39 had sick-headache which reappeared every few weeks despite my best correction of her low compound hyperopic astigmatism. I had three times gone over my work and found no change in her glasses was to be made. I feared I had what I had always been looking for—a typical migraine which I could not cure with glasses. Inquiry elicited the fact that the woman habitually did an enormous amount of literary work. I ordered presbyopic correction and bifocal spectacles to be worn constantly and the "migraine" has never shown a sign of itself since.

Case 3.—A healthy clear-headed intellectual man was given two pairs of spectacles for his myopic astigmatism, a stronger or higher correction for use at the theater, driving, etc., a weaker correction for reading and daily or constant use. For a year his wife and daughter observed, without telling him, that whenever he wore the strong, or accommodation-exciting

glasses he "caught cold" with coryza, hoarseness, etc., which at once disappeared when the weaker lenses were used. He used the stronger ones but few times a year. When certain of the strange coincidences his wife told her husband. In the past ten years the cold has been produced in this way a hundred or more times. Now if his weaker glasses get "crooked," or maladjusted, miscorrecting his axis of astigmatism by a few degrees, his cold promptly appears, to vanish in an hour after a visit to the optician.

Case 4.—A gentleman of 50 years of age had consulted many of the most famous oculists because of severe and frequently recurring subconjunctival hemorrhages. Some of these had refracted his eyes, some had not, but all had followed a not uncommon custom of charging such symptoms to gout. None had found any error of refraction, except, of course, a couple of diopters of presbyopia. By the most competent authority his eyes had been pronounced mathematically emmetropic and perfect. None, of course, had used a cycloplegic. With paralyzed accommodation I found 0.25 D. of simple myopic astigmatism axis 180 degrees in each eye. For several years he has had no hemorrhages and by his glasses he has had also such relief from other cerebral symptoms that he has had heavy iron spectacles made for use in his bath, so that he may not be without lenses for a minute.

SUGGESTIONS AS TO POSTMYD- RIATIC REFRACTION TESTS.

•

1

1

APPENDIX A.

SUGGESTIONS AS TO POSTMYDRIATIC REFRACTION TESTS.¹

THE reasons why "glasses fail to give relief" are many, and I have elsewhere formulated sixty-eight. When my patients go to other oculists I am always anxious to secure the records of work done and prescriptions ordered by them, so that I may learn what my mistakes have been, and thus be on my guard in future cases. Nothing is so instructive to the physician and helpful to the patient as the willingness to correct one's own errors, "relax one's own accommodation" and gain guidance and rules for future use. In studying my own case records and those of patients who have been treated by other oculists, I constantly come upon the fact that we have in the past paid too scant attention to the postmydriatic tests before prescribing glasses. Many oculists indeed do not make such tests but prescribe while the eyes are still under the cycloplegic. One well-known oculist writes me that he does not use a cycloplegic at all because he finds such wide, frequent, and contradictory changes between the results that he can do better without the cycloplegic. This seems to me a profound error.

¹ From *Annals of Ophthalmology*, July, 1904.

The differences between the refraction under cycloplegia and that after the accommodation-paralysis has passed off, are indeed marked, frequent and even contradictory, and I estimate that these differences will be found in from ten to twenty percent of cases. They may possibly be due:

1. To the kind of cycloplegic used.

The stronger and more lasting ones, I judge, cause the greatest differences. Homatropin and cocaine (combined) are the least liable to cause them.

2. To the method of instillation, purity of the drug, etc.

Used in the office for one hour prior to the tests, about every seven minutes, seems to me to give the best results.

3. To the time at which the tests are made.

They should be made at the height of the physiologic effect of the drug, not before or after.

4. To the hyperemia caused by the drug, the differences in physiologic conditions due to it, etc.

These may readily cause changes in corneal curves, tensions in muscles, etc.

To these causes may be added the following:

5. To the inclination of the axes of vision when the tests are made.

Most of our looking, and especially all straining work, reading, writing, sewing, etc., is done with the axes directed downward. Our tests in the oculists'

offices, under cycloplegia, are usually made with the twenty-foot cards on a level with the eyes. I have seen oculists' offices in which the cards were even considerably higher, making the axes incline upward. It seems evident that the muscular tensions in looking on a level or downward may frequently be so different as to change corneal curves, etc. When in conjunction with the next cause, as practically this factor must be taken, we have a possible source of changes of high importance.

6. To the fact of whether the test is made at the twenty-foot or the fourteen-inch distance.

The muscular tensions are certainly different in the two locations of the object fixed upon, and this, especially in cooperation with the preceding cause, may result in marked changes of astigmatic axes or amounts, etc.

7. To the fact per se of paralysis of the ciliary muscles and conversely of the full exercise of accommodation without cycloplegia.

A different result, sometimes existing, seems to be ascribable to the direct influence of active or paralyzed accommodation, the mechanism being difficult to understand.

8. To the well-understood difference in refraction of the central parts of the cornea and of those more peripherally located.

The test with the pin-hole disc brings this out in cases of doubt.

9. To the influence of binocular fusion.

There is sometimes a change of the axes of astigmatism when both eyes are in function from that made with the monocular test.

10. Torticollis, or Tilted Head; a twisted and tilted position of the head may be caused by a displacement of the axis of astigmatism of the dominant eye.

I have discovered about thirty-five such cases among my patients during the past four months,¹ in many of which there was secondary spinal curvature, all demonstrably due to an axis of astigmatism in the right eye from 10° to 20° out of symmetry. When the head was kept perfectly erect the misplaced axis was manifest. In the erect position the patient was "unable to see" with the axis chosen when the head was inclined to the former habitual position, and *vice versa*.

The practical lesson I have drawn from these ten considerations is that in cases of doubt or failure to relieve eyestrain reflexes, and in all cases of unsymmetric astigmatism, retests should be made, under cycloplegia and with great care; but especially as regards the postmydriatic tests with the accommodation spurred to its utmost; with near-tests in the reading

¹ See *American Medicine*, March 26, 1904.

position; in the cases of canted or twisted heads; and with both eyes open at near and distance.

These ten reasons should have been added to the sixty-eight already enumerated,¹ making seventy-eight in all, "why glasses failed to give relief."

¹ See *American Medicine*, July 4, 1903, and "Biographic Clinics," Volume II.

1. The first part of the document is a list of the names of the persons who have been appointed to the various offices of the city of New York.

A CASE OF “MATHEMATICALLY-
PERFECT EYES.”

APPENDIX B.

A CASE OF "MATHEMATICALLY-PERFECT EYES."¹

ON October 12, 1897, I was consulted by a gentleman fifty years of age, whose chief complaint was of subconjunctival hemorrhage, which had occurred on an average every two weeks during the past year. I found out that he had consulted a great many oculists during this time, who had either given general treatment for gout (of which there was some slight evidence), or has sent him to the general practitioner, or had only prescribed reading glasses, etc. The hemorrhages seemed to come on spontaneously and were bothersome chiefly because they gave the man such a frightful appearance and caused mental worry, rather than any decided pain or trouble of vision. One eye was generally affected at a time, and as the hemorrhage only stopped when the subconjunctival space was thoroughly filled with blood, the appearance of the eye and patient is easily imagined by any one. I frankly asked the gentleman what he supposed I could do for him, when the large number of the best men in the city had failed. His own faith was plainly little,

¹ Read before the Section of Ophthalmology, American Medical Association, June, 1898.

but I was compelled to try. General disease of any pronounced type was excluded by thorough examination; the family history and personal history were beyond reproach, and one of our most careful "internists" had treated him on general principles for this one ocular symptom without influencing it in the least. The muscular coordinations of the eyes were as perfect as they could be, and by all non-mydriatic tests both eyes were absolutely emmetropic; the visual acuity was 20/20 +. Indeed, the man had soon told me that he was an optical curiosity, other oculists having marveled at the emmetropism of his eyes, and one especially—a man of large practice and scientific ability—had repeatedly said that his was the only pair of "mathematically perfect eyes" he had ever seen. It was certainly a gloomy outlook for the man with a fad—the "oculist hobby-rider."

Relying, however, upon the results of many experiences I proceeded to work upon the basis of what have become axioms to me, viz., *No mydriasis, no diagnosis of refraction, and all presbyopia is only relative*. Under a mydriatic I found the visual acuity as perfect as it had been without it. Then I comforted myself with another maxim: *Perfect visual acuity is no proof of the nonexistence of an error of refraction*, and I was soon able to demonstrate an error as follows:

R. — Cyl. 0.25 D. ax. 90°

L. — Cyl. 0.25 D. ax. 180°

Now, I did not say to myself that this tiny error of refraction was the cause of the conjunctival hemorrhage; I did not then dream that it was, and told the patient that if any local cause for this existed I believed it was due to the failure to use presbyopic glasses while eating meals, card-playing, etc. With this end in view I ordered bifocal spectacles, for distance the cylinders as above, and for near a proper spherical added. Then came downright rebellion; the man was mad at the idea of wearing the "hideous things." I said, then, that this was my prescription and, unless followed, I stood discharged. He went away savage and disgusted, but did order the bifocals, wore them one day and, more wrathful than ever, ordered the optician to turn them into two separate pairs of eye-glasses. As I washed my hands of the case, I allowed the optician to do as the man desired, and not seeing him again I supposed he had left me for another and less dogmatic adviser. I had quite forgotten about the matter when, in two months, my office boy brought up a bill my secretary had sent the man, and a check to pay it, saying the gentleman had asked to have the receipt signed, would not come up, etc. Luckily, I remembered the name and returned the receipt by my own hand, impelled by a certain quizzical curiosity. He was evidently in a very different mood, said he did not want to trouble me, intended writing, etc., but was glad now to tell me how

happy he was with his eye-glasses. I have seen him several times since, and to shorten an overlong story, I will say that not only has there been no recurrence of the hemorrhages, except one very small one, since getting the glasses, but a previous discomfort uncomplained of, and hardly recognized, is completely relieved, but returns at once if the low cylinders are not worn; this discomfort is now so decided that he has had made heavy steel spectacles to wear in his bath, the sense of pressure and irritation being so great even in a time so short as that.

I shall not attempt to explain the *modus operandi* of a low astigmatism producing so severe and unwonted a result as these hemorrhages. That it did produce them I have not the shadow of a doubt, and the method is perhaps readily enough divined by all of you. There is only a single negative I wish to emphasize, and this is the reason I have gone into the rather gossipy details of this case: there is not the least crevice where through may creep the suspicion of hypnotism or autosuggestion. The man was mad at me and I was provoked at him; he refused to follow orders; had no faith in the diagnosis or the doctor; and as a cap to the climax I was utterly mistaken in my diagnosis! It was not the need of bifocals, or of presbyopic correction that was the true etiologic factor, but simply the low myopic reversed astigmatism. The fact of this only came out through unfaith and

indirection, by wearing the forbidden eye-glasses.

This has led me to entitle this report a case, *i. e.*, a disease of emmetropically perfect eyes, and so many lessons are suggested by it, lessons which I myself have long needed, and which, perhaps, one or two of you may profit by, that I have been moved to report the case chiefly for the fun of the *haec fabula docets*. These shall be most briefly recapitulated.

1. The most important lesson that springs into view, one which every day, and in every journal, and in every other case report, should be printed in double caps, is this: Although a patient has been examined by one or more good oculists and glasses prescribed, or reported as not needed, the fact has no significance whatever. It does not prove that eyestrain does not exist, nor that it is not a source of any of the results that eyestrain may produce. This seems extreme and even revolutionistic, but it is literally true. In this case the proof of the pudding is not in the eating. There are a hundred qualifications needed to the bald statement that "glasses did not lessen the symptoms," or "the oculist reported the eye-examination was negative," or "eyestrain was ruled out by careful tests," etc., etc. I don't care a button for such an assertion; it is simply meaningless unless very many other considerations go with it. Do not for an instant think I make an exception of myself, or wish to cast any slur upon the work of others; that would be simply silly.

What I mean, of course, is that in these infinitely delicate matters, in these calculations of infinitesimals, slight differences, inobviable personal equations, etc., may indeed occur and be the reason of failure, but beyond all this there are numberless questions, *e. g.*, as to correctness of make and accuracy of adjustment of the glasses; as to methods of wear or non-use; as to habits and peculiarities of eye-work; as to the length of disease; as to suddenness of consequent refraction changes; as to the frequent impossibility of curing a result by curing its cause; as to complicating causes; as to intercurrent general diseases, etc., etc. Not only in the case reported, but in hundreds more I have learned that my own errors, mistakes, and blunders, as well as those of others, may show the fallacy of a single judgment; a multitude of provisos must be excluded and the subsequent history closely scanned in order to prove or to disprove the lumpish dictum "glasses gave no relief." Facts are stupid and useless things without an intellect to discriminate, marshal and use them. It takes more than a lot of rocks to make a lock or a breakwater.

2. A very slight or uncorrected error of refraction may be the cause of strange and serious reflexes and results, and this is especially true if it be unsymmetrical astigmatism, and still more surely if it is a low degree myopic astigmatism, in which there is no means of escape by blunting into amblyopia, or by

shunting into heterophoria, and no possibility of a ciliary-muscle contraction overcoming the defect.

3. Low-grade myopic astigmatisms are hard to diagnose and are in practice too commonly overlooked and neglected, although they must be as common relatively as hyperopic varieties.

4. It is only by the mydriatic, combined with infinite patience, delicacy, and skill that such astigmatisms are correctly diagnosed. Perfect visual acuity is no disproof of coexisting ametropia.

5. The mydriatic is more necessary in presbyopia than previously. All the text-books and teachings are wrong in this. Precisely when the compensatory mechanism is being narrowed by presbyopia, is there the greatest need of accuracy in the correction of the smallest degrees of anisometropia and astigmatism. Then, also, the vital powers are failing and the cataract-age is nearing, so that precision in refraction is doubly and trebly imperative. Presbyopia is always relative, never absolute, particularly if proper glasses have not been worn during many previous years. Without a mydriatic there is no adequate estimate of errors of refraction, and between the ages of forty and fifty-five the estimate should be painstaking to the uttermost degree, especially if any suspicious reflexes exist.

6. Absolute emmetropia, "a mathematically perfect

pair of eyes," does not, I believe, exist. A perfect leaf has not been found, nor absolute symmetry in any organic thing. The report of perfect emmetropia is a confession of negligence and unskilfulness. I have made such reports myself and can, therefore, speak dogmatically. If such a diagnosis has been made without a mydriatic the negligence deserves a much harsher naming.

7. And even if there were such a mathematically perfect pair of eyes, I can easily imagine circumstances in which such eyes might be the cause of morbid results. As orthophoria is always a disease, so emmetropia, in a seamstress or in almost any hard-pushed eye-worker; in a neurasthenic, in a heterophoric, or in a presbyope, may functionally be a disease and require correction by glasses. Emmetropia is nature's unrealized ideal for the animal, savage and primitive man. A low degree simple myopia, alike in both eyes, is the desideratum of the slave of civilization.

To focus this long-winded reading into a sentence I should say that when a possible or suspicious ocular reflex exists, painstaking mydriatic refraction and correction are necessary both in presbyopia and in "a mathematically perfect pair of eyes." And when this has been admitted comes the rider that even after all has been done it cannot, with utter certainty, be said that the eyestrain was not, or is not, the ultimate source of the morbid symptom.

INDEX.

Abdomen, diseases of and eyestrain.....	40
"Academy" headache	151
Accommodation—paresis of and inhibition reflex.....	392
paresis of	379
subnormal, and premature presbyopia.....	377
Adjustability of desk seat.....	307
Adjustment of the body and astigmatism.....	288
Advance hindered by "leaders".....	16, 66, 68, 231
Air-passages, upper, inflammations of and eyestrain.....	40
Alcoholism and eyestrain.....	194
Ambidexterity, nonexistence of.....	353
Ametropia—general body conditions.....	39
and myopia	36
Anesthesias and migraine.....	237
Anomalies of refraction—and cataract.....	36
and conjunctivitis	35
and glaucoma	35
and heterophoria	35
and iritis	35
and keratitis	35
and strabismus	35
Antisepsis and Semmelweiss.....	426
Appendicitis and eyestrain.....	40
Astigmatism—according to rule, axis in.....	145
and adjustment of the body.....	288
and eyestrain	18
and headaches	18
and head-tilting	42, 277
and myopia	433

Astigmatism—and puberty	49
and slanted writing.....	299
asymmetric, and head-tilting.....	371
asymmetry of axes in.....	146
effects of	130
importance of low degrees of.....	140
in the dominant eye.....	369
Axes, asymmetry of in astigmatism.....	146
Axis in astigmatism according to rule.....	145
Bicycle and headache.....	153
Biographic Clinics reviewed by Dr. John Green.....	55
Biology in relation to the new ophthalmology.....	27
Blind, supposedly so, found not to be.....	69
Brain-disease—and eyestrain	434
so-called, and eyestrain.....	188
“Brain-fag” and eyestrain	109, 234
Bright's disease and eyestrain.....	187
Camera, the, and the eye.....	29
Cataract and refractive anomalies.....	36
Cephalalgia spasmodica	212
Chest-pain and eyestrain.....	383
Children in New York Schools, eyestrain of.....	1
Civilization—and eyestrain	47, 65
and increase of functional diseases.....	47
process of and dextrality.....	346
Clinical proofs of the eyestrain theory.....	10
Colds—and influenzas, Symonds.....	86
and migraine	236
“Collective investigations” of eyestrain.....	18
Complexity of the eye.....	59
Conditions, general, of the body and ametropia.....	39
Conjunctivitis and refractive anomalies.....	35
Continent, the, of Europe, and eyestrain.....	9, 17, 221
Crime and eyestrain.....	2, 45
Curvature of spine—and slanted writing.....	252
and eyestrain	2, 41, 251

Cycling and headache.....	153
Deafness and eyestrain.....	396
Depression and eyestrain.....	193, 240
Dermatitis and eyestrain.....	385
Desk—inclination of	308, 315
inclination of and eyestrain.....	307
Desks—inclination of and writing posture.....	272
and slanted writing.....	272
the, in schools.....	322
Desk-seat, adjustability of	307
Dextral, definition of	343
Dextrality—and civilization	346
and intellectual functions.....	350
and sinistrality	341
definition of and of corresponding terms.....	344
in music	347
reasons for	341
Dextrocularity—confirmation of the theory.....	373
pathologic results of	363
Difficulties of obtaining correct glasses.....	4
Discoveries, medical—motives for ignoring.....	430
reception of	415
Discovery of eyestrain.....	433
of subnormal accommodation in the young.....	408
Diseases—of abdomen and eyestrain.....	40
of frontal sinus and eyestrain.....	40
Dominant eye—and astigmatism.....	369
and slanted writing.....	301
in writing	311
necessity for preserving.....	367
Dysmenorrhea and eyestrain.....	20
Dyspepsia and eyestrain.....	48
Edes, R. T., on Eyestrain and its effects.....	9
Ellis on eyestrain of Wagner.....	18
Emmetropic eyes	15, 30, 496
Energy of Symonds.....	89

English profession and eyestrain.....	10, 17
Enuresis and eyestrain.....	43
Epilepsy and eyestrain.....	45, 65, 70, 172
Equilibrium a visual necessity.....	88
Equipment of ophthalmic clinics inadequate.....	69
Errors, of refraction, slight, and morbid results.....	15, 31
Evils of eyestrain.....	334
Evolution and the eyes.....	57, 61
Exaggeration and eyestrain.....	443, 457
Exaggerations of the opposition to the eyestrain theory.....	22
Exercise, severe physical, and eyestrain (Taine).....	103
Eye—and camera	29
and hand, relation of.....	366
and intellect	62
and migraine	20, 46, 65, 67, 221, 244
complexity of	59
dominant, and slanted writing.....	301
dominant, astigmatism in.....	369
dominant, in writing.....	311
dominant, necessity for preserving.....	367
Eye-glasses vs. spectacles.....	480
Eyes—and evolution	57, 61
emmetropic	15, 30, 496
importance of inequality of.....	145
mathematically perfect	15, 30, 496
Eyesight, defective, of New York school-children.....	1
Eyestrain and alcoholism.....	194
and appendicitis	40
and astigmatism	18
and brain-disease	434
and brain-disease so-called.....	188
and "brain-fag"	109, 234
and Bright's disease	187
and chest-pain	383
and civilization	47, 65
and Continent of Europe.....	9, 17, 221

Eyestrain and crime	2, 45
and depression	193, 240
and dermatitis	385
and desk, slope of.....	307
and diseases of abdomen.....	40
and disease of frontal sinus.....	40
and disorders of motility.....	238
and disorders of sensation.....	238
and disorders of stomach.....	41
and dysmenorrhea	20
and dyspepsia	47
and enuresis	43
and epilepsy	45, 65, 70, 172
and exaggeration	443, 457
and forgetfulness	191, 192
and functional diseases.....	47, 65
and gout	15, 188
and hearing	396
and hysteria	173, 180
and inflammations of the upper air-passages.....	40
and injury to the head.....	391
and insanity	45, 65, 70, 194, 241
and intemperance	194
and literary work.....	241
and medical literature.....	438
and medical periodicals.....	442
and memory, lapse of.....	191, 192
and menstrual disorders.....	20, 49
and migraine	20, 46, 65, 67, 221, 244, 377, 450
and miscellaneous disorders	11, 12, 13, 14, 40
and neurasthenia	173, 180, 195, 198
and neurologists, the	439
and nutritional disorders	19
and pessimism	72, 240
and profession in England.....	10, 17
and refraction, low errors of.....	449

Eyestrain and rest-cure	44
and school-life	69
and scoliosis	2, 41, 251, 377
and sea-sickness	181
and severe physical exercise (Taine).....	103
and sinistocularity	401
and spinal curvature.....	2, 41, 251, 377
and suicide	45, 65, 73, 93, 192
and text-books	231
and toothache	387
and train-sickness	181
and truancy	2, 71
and tuberculosis, Symonds.....	86
and vasomotor disturbances.....	21
as a cause of headache and other neuroses.....	117
as viewed by Dr. John Green.....	55
basic similarities in symptoms of sufferers.....	109
cases, Snell's analysis of.....	137
collective investigations of.....	18
discovered by physicists.....	33
discovery of	433
evils of	334
functional results	32
gastric symptoms of.....	128
giddiness of	127, 191
headache of, situation, characteristics, etc.....	125
historical	118
how it produces its effects.....	9
in psychologic development of the young.....	10
insomnia of	127, 164, 192
literature upon	54, 438, 462
Mobius' belief as to.....	111
of New York school-children.....	1
of Taine	99
of Wagner, Dr. Ellis on.....	18
preponderance of women with.....	137, 233

Eyestrain, professional opinions upon	52, 231
scoliosis, and the orthopedist.....	453
theory and leaders of the profession.....	458
theory, clinical proofs of.....	10
theory, Dr. John Green upon.....	467
theory opposers, exaggerations of.....	22
theory prejudiced by inaccurate work.....	52
theory, professional opinion of.....	463
theory, reasons for rejection of.....	50
unfortunate term	31
why sometimes not relieved by spectacles.....	448
writing a particular cause of.....	337
Forgetfulness and eyestrain.....	191, 192
Functional—disease and civilization.....	47
disease and eyestrain.....	47, 65
origin and results of eyestrain.....	32
Function—morbid, and pathology.....	7
of medical leaders.....	461
Functions, interdependence of.....	38
Gastric—crisis of migraine.....	235
symptoms of eyestrain.....	128
General health and presbyopia.....	479
General Medicine in relation to the new ophthalmology.....	27
Giddiness of eyestrain.....	127, 191
Glasses, correct, difficulties of obtaining.....	4
Glaucoma and refractive anomalies.....	35
Gout—and eyestrain.....	15, 188
and migraine	236
Gravity and slanted writing.....	298
Green, Dr. John—Upon Eyestrain and Biographic Clinics....	55
upon the eyestrain theory.....	467
Hand and eye, relation of.....	366
Handwriting, slanted—and hygiene.....	295
and visual function.....	295
Hare on nutritional disorders and eyestrain.....	19
Headache—"academy"	151

Headache and astigmatism	18
and bicycle	153
and eyestrain	117, 125, 191
ocular origin of.....	23
of eyestrain, situation, characteristics, etc.	125
of Symonds	79
spasmodic	212
" theater "	151
Head, injuries to and eyestrain.....	391
Head-tilting—and astigmatism	42, 277, 371
and scoliosis	401
other organic results of.....	283
Hearing and eyestrain.....	396
Heredity and migraine.....	230
Heterophoria and refractive anomalies.....	35
Hotz, Dr. F. C., on refraction.....	8
House-organs and scientific advancement.....	445
Hygiene and slanted writing.....	295
Hysteria and eyestrain.....	173, 180
Illumination of school-rooms.....	283
Inaccurate work and acceptance of eyestrain theory.....	52
Inclination of desk in writing.....	272, 308, 315
Indifference of profession to medical discoveries.....	5, 16, 23
Inequality of eyes, importance of.....	145
Insanity and eyestrain.....	45, 65, 70, 194, 241
Insomnia of eyestrain.....	127, 164, 192
Intellect and vision.....	62
Intellectual functions and dextrality.....	350
Intemperance and eyestrain.....	194
Interdependence of functions.....	38
Introduction	1
Investigations " collective " of eyestrain.....	18
Iritis and refractive anomalies.....	35
Keratitis and refractive anomalies.....	35
Leaders, medical—function of.....	461
and eyestrain theory.....	458

- Leaders, medical—opposition of to advance.....16, 66, 68, 231
 Light for working, quality of and presbyopia..... 478
 Literary work and eyestrain..... 241
 Literature, medical, and eyestrain.....54, 438, 462
 Logomachy and psychiatry..... 44
 Malposture—and slanted writing..... 295
 not the cause of myopia..... 329
 writing, factors of..... 298
 Medical—discoveries, motives for ignoring..... 430
 discoveries, reception of..... 415
 leaders, function of..... 461
 leaders and eyestrain theory..... 458
 leaders, opposition of to advance.....16, 66, 68, 231
 literature upon eyestrain..... 462
 periodicals and eyestrain..... 442
 Medicine, general, in relation to the new ophthalmology.... 27
 Memory, lapse of, and eyestrain.....191, 192
 Menopause—and migraine 233
 and presbyopia49, 233
 Menstrual disorders and eyestrain.....20, 49
 Migraine—and eyestrain20, 46, 65, 67, 221, 244, 450
 and heredity 230
 and ocular paralysis..... 238
 and presbyopia 233
 and puberty 233
 and scotoma scintillans..... 222
 and the eye..... 20, 46, 65, 67, 221, 244
 and the menopause..... 233
 cause of201, 207, 244, 377
 classification and etiology..... 207
 colds, rheumatism and gout..... 236
 derivation of term..... 201
 gastric crisis of..... 235
 history and etiology of..... 201
 in literature and history..... 203
 pareses, paralyses, and anesthetics..... 237

Migraine—periodicity of	234
prodromal symptoms	216
psychic disorders of.....	239
relation to age, sex, and occupation.....	232
sequels of	243
the typical attack.....	217
treatment of	242
Mobius and eyestrain.....	111
Morbidity of slight errors of refraction.....	15
Motility, disorders of, and eyestrain.....	238
Motives for ignoring advance in medicine.....	430
Muscle-balance, faulty	149
Music, dextrality in.....	347
Mydriasis—in presbyopia	474
suggestions as to refraction tests after.....	487
Mydriatic essential.....	147
Myopia—and ametropia	36
and astigmatism	433
and slanted writing	295
causes of	331
not caused by malposture.....	329
Near-work and presbyopia.....	477
Neck-curves precede spinal curves.....	253
Nervous system and slight errors of refraction.....	157, 192
Neurasthenia and eyestrain.....	173, 180, 195, 198
Neurologist's, a, confession.....	23
Neurologists, the, and eyestrain.....	439
Night-terrors of John Addington Symonds.....	78
Nutrition, disorders of and eyestrain.....	19
Occidental writing postures and scoliosis.....	289, 317
Ocular—origin of headache.....	23
paralysis and migraine.....	238
Ophthalmic clinics conducted by students.....	69
Ophthalmology—and prophylaxis	37
most difficult field of practice.....	15
new and old, relations to each other.....	34

INDEX.

511

Ophthalmology—"new" definition of	28
old and new, distinction between.....	27
"old," definition of.....	27
reactionary spirit in.....	17
the new, in relation to General Medicine, Biology, and Sociology	27
Opposition of "leaders" to advance.....	16, 66, 68, 231
Opticians and rural patients.....	
Optics—pathologic	30
physiologic	29, 30
Oriental writing postures and scoliosis.....	289, 317
Origin of slanted writing.....	326
Orthopedist, the, and eyestrain and scoliosis.....	453
Paper—position of in writing and scoliosis.....	285
position on desk in writing.....	304
Paralysis—and migraine	237
ocular, and migraine.....	238
Paresis and migraine	237
Pathogenesis of tuberculosis, Symonds.....	87
Pathologic—optics	30
results of dextrocularity and sinistrocularity.....	363
Pathology—and morbid function.....	7
and vision	7
caused by abnormal physiology.....	32
Pen, position of in writing.....	308
Perfect, mathematically, eyes.....	15, 30, 496
Periodicity of migraine.....	234
Pessimism and eyestrain.....	72, 240
Physicists the discoverers of eyestrain.....	33
Physiologic optics	29, 30
Physiology, abnormal, the origin of pathology.....	32
Position of pen in writing.....	308
Posture—morbid, in writing.....	2, 252, 264, 272
sitting, and scoliosis.....	284
the, in writing.....	264
Premature presbyopia and subnormal accommodation.....	377

Presbyopia—and general health.....	479
and the menopause.....	49, 233
and migraine	233
and mydriasis	474
and near-work	477
and quality of working light.....	478
begins with life.....	405
onset of	473
premature, and subnormal accommodation.....	377
Symonds'	90
Problems of presbyopia.....	473
Professional—indifference	5, 46, 231
opinion of eyestrain theory.....	55, 231, 463
Profession—English, attitude toward eyestrain.....	10, 17
leaders of, and eyestrain theory.....	458
Pronger, C. Ernest, "Slight errors of refraction and their influence on the nervous system".....	157
Proofs, clinical, of the eyestrain theory.....	10
Prophylaxis in ophthalmology.....	37
Psychiatry and logomachy.....	44
Psychic disorders of migraine.....	239
Psychology of development in youth and eyestrain.....	10
Puberty—and astigmatism	49
and migraine	233
Reactionary spirit in ophthalmology.....	17
Reasons for dextrality.....	341
Reception of Medical discoveries.....	415
Rejection of eyestrain theory, reasons for.....	50
Refractionist and the optician.....	34
Refraction—F. C. Hotz on.....	8
need for accurate.....	474
should be accurately taught.....	53
slight errors, and morbid results.....	15, 31, 157, 449
slight errors, influence on nervous system.....	157
-tests, post-mydratic, suggestions as to.....	487
-work, inaccurate	378

Refractive—	anomalies and heterophoria.....	35
	anomalies and strabismus.....	35
	errors increasing	194
Rest-cures and	eyestrain.....	44
Rheumatism and	migraine.....	236
School-desk, the		322
School-life and	eyestrain.....	69
School-room, illumination of.....		283
Scientific advancement and	house-organs.....	445
Scoliosis—age when first noticed.....		254
	and eyestrain	2, 41, 251
	and illumination of school-rooms.....	283
	and oriental and occidental writing postures.....	289, 317
	and sitting-posture	284
	and slanted writing.....	252, 295
	and position of writing paper.....	285
	causes of	258
	eyestrain, and the orthopedist.....	453
	frequency of	255
	in relation to sex.....	255
	ocular factors of.....	251
	statistics of the kind of curves.....	256
Scotoma scintillans and	migraine.....	222
Sea-sickness and	eyestrain.....	181
Semmelweis and	antisepsis.....	426
Sensation, disorders of, and	eyestrain.....	238
Sick-headache		212
Similarities in symptoms of	eyestrain sufferers.....	109
Sinistral, definition of.....		344
Siniestrality—and dextrality		341
	definition of corresponding terms.....	344
	origin of	355
Sinistrocularity—and	eyestrain	401
	pathologic results of.....	363
Sinus, frontal, inflammation of and	eyestrain.....	40
Sitting-posture and	scoliosis.....	284

Slanted writing—and malposture in writing.....	252
and visual function.....	295
Sleepiness of Symonds.....	79
Slight errors of refraction—and their influence on the nervous system (C. Ernest Pronger).....	157
influence of	15, 31 449
Slope of desk and eyestrain.....	272, 307, 308, 315
Snell's analysis of eyestrain cases.....	137
Snell, Simeon, "Eyestrain as a cause of headache and other neuroses"	117
Sociology in relation to the new ophthalmology.....	27
Some problems of presbyopia.....	473
Spectacles—not omnipotent	24
vs. eye-glasses	480
why they sometimes fail to relieve.....	448
Speech-center—location of	350
relation to intellectual functions.....	365
Spine, curvature of—and eyestrain.....	2, 41, 251
and slanted writing.....	252, 295
and writing postures.....	289, 317
Stomach disorders and eyestrain.....	41
Strabismus and refractive anomalies.....	35
Subnormal accommodation and premature presbyopia.....	377
Suffering of Symonds, connection with writing.....	82
Suggestions as to post-mydriatic refraction tests.....	487
Suicide and eyestrain.....	45, 65, 73, 93, 192
Symonds, John Addington—colds and influenzas.....	86
energy of	89
life tragedy of.....	77
presbyopia	90
tuberculosis of and eyestrain.....	86
walking for relief of symptoms.....	84
writing and suffering connected.....	82
Taine, ill-health of	99
severe exercise and eyestrain.....	103
walking	105

Teaching, accurate, necessary in refraction work.....	53
Testing, careful, essential.....	148
Text-books on eyestrain.....	231
" Theater " headache	151
The history and etiology of migraine.....	201
The life tragedy of John Addington Symonds.....	77
The new ophthalmology and its relation to general medicine, biology, and sociology.....	27
The optician and the refractionist.....	34
The optic and ocular factors in the etiology of the scoliosis of school-children	251
Toothache and eyestrain.....	387
Train-sickness and eyestrain	181
Travel of Symonds.....	82
Truancy and eyestrain.....	2, 71
Truths, new, modes of killing.....	429
Tuberculosis of Symonds and eyestrain.....	86
Vasomotor disturbances and eyestrain.....	21
Vision—and equilibrium	288
and evolution	57, 61
and intellect	62
and pathology	7
of the writing-field necessary.....	312
Visual function—and slanted writing.....	253
the cause of slanted writing.....	295
Wagner, Ellis on eyestrain of.....	18
Walking—Symonds	84
Taine	105
Walton, G. L., a neurologist, and his admissions.....	23
Women, preponderance of with eyestrain.....	137, 233
Writing—and suffering, Symonds, connection between.....	82
a particular cause of eyestrain.....	337
dominant eye in.....	301, 311
-field, necessity of seeing.....	312
malposture, factors of.....	298
-position, leaning to the right.....	310

Writing—position of pen	308
posture,	264, 272, 298, 310
posture and school-desks	272
posture, morbid	2, 252, 264, 272
slanted, and astigmatism	299
slanted, and desks	272, 295
slanted, and dominant eye	301, 311
slanted, and gravity	298
slanted, and hygiene	295
slanted, and malposture	295
slanted, and myopia	295
slanted, and scoliosis	252
slanted, and spinal curvature	295
slanted and the visual function	253, 295
slanted, when it originated	326
vertical vs. slanted	296

LANE MEDICAL LIBRARY

To avoid fine, this book should be returned on
or before the date last stamped below.

DEC 21 1934

R

703

G68

V.3

1905

LANE

HIST



